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Tuberculosis Problems.—Sanatorium treatment has not been the ideal treatment for tuberculosis. Early cases are not discovered or they refuse to enter a sanatorium. Advanced and moderately advanced cases are not cured after a few months in a sanatorium. The family and not the tuberculous individual is the unit to be treated. The village-settlement plan is at present the best plan offered for the solution of this problem. The diagnosis of the disease tuberculosis is made too late. We do not know of its onset but only recognize if after invasion of tissue has progressed to some degree. We are trained in morbid anatomy. Symptoms appear only after there has been some anatomical change and patients are seen only after symptoms become more or less pronounced. Onset of the disease should be defined at the moment at which the equilibrium of the defensive mechanism is first threatened. The causes of tissue destruction or fibrosis

should be known and classification of tuberculosis made upon them. Endocrinology will in due time give us early diagnostic signs. It is necessary that exact and precise knowledge of the processes involved in the term diathesis and of the biochemical agencies behind them. Since actual spread of infection cannot be prevented natural resistance must be raised. Healed lesions found at autopsy do not signify that tuberculosis is a curable disease but the resisting mechanism of the individual was able to maintain biochemical equilibrium and no symptoms appeared. Too much time has been spent upon diseased parts and not upon disease processes. We must study the effects of infection in both diseased patients and those without disease, but above all we should know the natural mechanism of resistance. We also shall study chemical idiosyncrasies and their relations to the defense mechanism and we shall try to secure some reliable data which we can use to prevent infection from leading to disease. Papworth offers opportunities for these studies.—*Tuberculosis: Why is it still a Problem, P. Varrier-Jones, J. State Med., August, 1933, xli, 435.*—(*J. F. B.*)

Tuberculosis Problems in General Practice.—Antituberculosis propaganda and the development of tuberculosis specialists have produced an apathy in the attitude of many doctors toward tuberculosis. Four clinical types of tuberculosis are illustrated by the following case reports: *1:* Chronic tuberculosis beginning insidiously and becoming well advanced before diagnosis is exemplified by the case of a young woman who gradually developed fatigue, slight loss of weight and slight afternoon fever during the six months before the presence of upper-lobe infiltration with excavation was diagnosed. After a year of sanatorium treatment she married and was discharged in good condition. Four years later she gave birth to a child, which developed tuberculosis at the age of five years, soon after its mother had a relapse. An alert family physician could have prevented this. *2:* The importance of pleurisy with effusion and the relentless advance of pulmonary tuberculosis in certain persons are seen in the case of a young nurse. Left-sided pleural effusion, which was negative on guinea-pig inoculation, was treated by aspiration and bed-rest for six weeks. Physical signs and a chest roentgenogram were then negative and work was resumed. Six months later there occurred a right-sided pleural effusion, in which tubercle bacilli were found. After five months in a sanatorium she was discharged with negative physical signs and roentgenograms as "suspected tuberculosis." She worked a year and then developed bilateral apical tuberculosis which progressed slowly, so that she was bed-ridden six years after the onset of the first pleurisy. The immediate treatment of pleurisy with effusion is aspiration of the fluid. It does not tend to recur. The follow-up treatment requires prolonged rest. The family doctor should act as liaison officer between the patient and sanatorium after discharge. *3:* The usually hopeless prognosis of miliary tuberculosis is illustrated by the case of a young man who had had dry pleurisy as a boy and developed pleurisy with effusion at the age of thirty years. Fever persisted and roentgenograms revealed fine, diffuse mottling through both lungs. Tubercle bacilli were found in the sputum, faeces and urine, and terminal meningitis developed. That recovery may sometimes take place is shown by the case of a negress who recovered after protracted illness. She had a typical chest roentgenogram and the histology of tuberculosis in a skin lesion. *4:* Tuberculosis has appeared infrequently in medical students at Harvard, but usually unexpectedly, in boys previously supposed to be healthy. That the roentgenogram may indicate a poorer prognosis than the clinical course warrants is shown by the case of a robust young man who had haemoptyses after a violent tennis game. Roentgenograms revealed acute tuberculous pneumonia and the sputum contained tubercle bacilli. All symptoms disappeared rapidly on bed-rest and work was resumed within a year. His health has remained satisfactory.—*Problems of Pulmonary Tuberculosis in General Practice, R. Fitz, Ann. Int. Med., August, 1933, vii, 245.*—(*R. M. F.*)

Public Health and Tuberculosis.—In Detroit a successful program of coöperation between practising physicians and public health officials has been in effect for some years. The organization followed seems applicable for tuberculosis control. Parents are urged to take their children to their family physician for tuberculin testing. Five thousand parents followed this advice in April and May of 1933. Arrangements are in progress with the local roentgenological society to coöperate with the Health Department in X-ray examinations.—*Public Health and Tuberculosis, Henry F. Vaughan, Amer. J. Roentgenol. & Rad. Ther., September, 1933, xxx, 300.*—(*E. R. L.*)

Tuberculosis in Nurses.—Because of the incidence of pulmonary tuberculosis and erythema nodosum in the women in the training school attached to one of the New Zealand Base Hospitals, an inquiry into the health of the nursing staff was conducted.

A review of other hospitals revealed a very low percentage of tuberculosis among permanent sanatorium nurses. In the base hospital under consideration, the women entering training were in excellent health and the housing and working conditions were regarded entirely satisfactory. During 1926 to 1931 inclusive, 13 cases of erythema nodosum occurred. There was no record of sanatorium service in 3 of these nurses, the onset varied between six weeks to two months after exposure in 9, and the onset was delayed for six months after exposure to tuberculosis in only one case. During 1930 and 1931, 11 cases of pulmonary tuberculosis occurred. This is an incidence of 3 per cent *per annum*. Three of these nurses had not served in the sanatorium but 2 of the 3 had been exposed to unrecognized risks. Eight of these nurses showed signs of pulmonary tuberculosis within twelve months of their sanatorium service. Of the 11 cases, 9 occurred in country girls. In the course of this inquiry 152 nurses were tested by the Pirquet method and 85 per cent reacted positively. The majority of negative reactors were still in their first two years of training. This suggests that a negative reaction becomes positive during the course of training. Freedom of disease was demonstrated in comparable groups of women not exposed to infection. The work of Ross, Heimbeck, and Greer is reviewed. Rigid medical asepsis is advised as the most practicable protective measure for these young women.—*An Inquiry into the Incidence of Tuberculosis among Nurses in a New Zealand Hospital, D. W. C. Jones, Tubercle, November, 1933, xv, 59.*—(*T. O. R.*)

Tuberculosis in Tennessee.—One element of a state-wide study of tuberculosis in Tennessee has been an investigation of 132 negro families residing in Kingsport in 1930. The schedule included (1) a record of general conditions of environment of the household as a unit; (2) an individual record of each person residing in the household at the time of the investigation; (3) for individuals giving a history of disease considered probably tuberculous, a summary, giving the time and manner of onset, hygienic management and other pertinent data; and (4) a record of each person who formerly lived in the household. Altogether, the records include 794 persons. Of the 556 persons living in the households at the date of record, 550 were examined and, of these, 24 were found to have tuberculosis; of the 238 former members of these households, 1 had active tuberculosis at the date of record and 27 had died from the disease, making for the entire population a total of 52 cases of tuberculosis. Households that have contained cases of tuberculosis, especially fatal or existing active cases, are more crowded, families are larger and the rental value of residences is lower than those with no tuberculosis; milk consumption per capita is considerably lower and evidence of filth and untidiness in the home is three times more frequent. The data show no unusual prevalence of tuberculosis in any occupational group except among day-laborers, where the prevalence of disease is 234 per thousand persons. Two of the eleven teachers in the city schools and slightly more than 2 per cent of the school population had tuberculosis. In 75 mothers in these households, considered only during the child-bearing period, cases of tuberculosis have occurred four times and death eleven times more frequently during the one-year period immediately following childbirth than during other times. Three per cent of cases of influenza, 6 per cent of pneumonia and 19 per cent of pleurisy were followed within a year by tuberculosis. For this small group of families apparently tuberculosis in one consort has had little influence on the development of the disease in the other. Slightly more than 200 children were orphaned per hundred deaths from tuberculosis in parents. Since the death of the parent, 21 children orphaned have suffered an annual mortality rate, from all causes, of 67.4 per thousand. Of 12 deaths, five occurred during the first year of life.—*Tuberculosis Studies in Tennessee: Tuberculosis in the Negro as Related To Certain Conditions of Environment, J. A. Crabtree, J. Am. M. Ass., September 2, 1933, ci, 756.*—(*G. L. L.*)

Tuberculosis in Celts.—Doctor John A. Musgrave, county medical officer of health for Louth (Irish Free State), postulates in his annual report on tuberculosis that the high rates in the Celt are due to the younger communal immunity rather than to an immutable racial susceptibility. In support of this thesis is the fact that tuberculosis, in various countries, is receding in urban and advancing in rural communities. Although this decrease may be explained partly by the improvement in urban sanitation, the thorough tuberculinization of urban districts is an important factor. In Ireland the urban dwellers have not yet acquired this immunity. Contributory factors to the high Celtic rates are climate, dietary deficiencies, the frequency of bovine infection, and the lack of intensive and extensive health propaganda. —*Tuberculosis and the Celt, Brit. M. J., September 9, 1933, no. 3792, 505.*—(*T. O. R.*)

Tuberculosis in Belfast.—Doctor Andrew Trimble, Chief Tuberculosis Officer

for Belfast, reports that in 1932 there was a marked decrease in the number of women suffering from tuberculosis as compared to that of men. The course of the disease in Ireland is apparently becoming more chronic, which may explain the lengthening of the period between the inception of the disease and its termination. Factors of overwhelming importance in the campaign against tuberculosis are the improvement of the living conditions of the people, the isolation and treatment of tuberculous patients, and the use of pasteurized milk.—*Tuberculosis in Belfast, Brit. M. J., September 23, 1933, no. 3794, 583.*—(*T. O. R.*)

Tuberculosis in Germany.—The anti-tuberculosis campaign organization is excellent and the buildings and equipment are impressive, but a partial financial paralysis of activity is becoming so marked that future tuberculosis mortality rates are feared. Tuberculosis officers, although they have equipment for following cases, have very little money available for sanatorium therapy. Insurance companies have lowered their grants to patients, and have discontinued dispensary work in some districts, although those units are needed more than ever now. The Reich plan, for example, which formerly ensured careful observation of adolescent contacts until they reached the age of 30 now prefer to isolate infectious cases in homes, choose the least expensive sanatoria in necessary cases, employ stricter selection of sanatorium cases, limit strictly convalescent cures and discontinue all expense at the earliest possible moment. For purely financial reasons preventive measures have been curtailed and great reductions made in general health protection and social medicine. About one person in four in Germany now receives public relief. One man with four dependents receives only from 13 to 20 marks per week. A proper standard of nourishment cannot be maintained on this small amount although dietetic instructions regarding cheap, nourishing, wholesome meals are given. School children have not yet apparently suffered, but young mothers have. The paradox to this picture is the steadily declining death-rate from all causes. The tuberculosis death-rate too has steadily declined from 18.7 per 10,000 in 1906 to 10.5 in 1925 and to 7.9 in 1930. The mortality rate of Berlin, the highest in the country, has also steadily declined. It is apparent that the unique system of insurance which closely binds social insurance and social welfare is responsible for such progress. How long it can last under present conditions is questionable.—*Impressions of the Tuberculosis Problem in Germany, V. B. F. Dawkins, Jour. State Med., September, 1933, xli, 539.*—(*J. F. B.*)

Treatment of Tuberculosis in Germany.—In Germany the campaign against tuberculosis is waged primarily by social insurance organizations in connection with private, industrial and charitable organizations. The Tuberculosis Treatment Institute (Dispensary) is the primary unit of operation. A health-education program is launched from here. Patients are examined and advised. Social and economic factors are especially stressed, because these have a particularly devastating influence in tuberculosis. For the last financial year, there were 1,360 of such institutes which covered approximately 94 per cent of the total population of Germany. The total number of infectious tuberculosis patients in Germany is roughly 168,000. Seven out of every 10,000 of the population die of tuberculosis. Among the invalid insurance organizations, there were, at the end of 1931, 59 institutions with 9,052 beds for the treatment of pulmonary cases, 61 convalescent homes with 7,895 beds, and 20 institutions in forests for convalescence.—*The Treatment of Tuberculosis in Germany, H. E. Schuchardt, Tubercle, June, 1933, xiv, 390.*—(*T. O. R.*)

Bovine Tuberculosis in Human Beings.—An appreciable percentage of pulmonary tuberculosis in the human being is ascribable to the bovine tubercle bacillus. While the path of entry of the bovine bacillus is usually through the alimentary tract with infection of the mesenteric lymph node, there is evidence that in a proportion of the cases infection may occur through the tonsils. It may be as virulent to man as the human tubercle bacillus. Data dealing with the prevalence of tuberculosis in cows from scattered sections of Great Britain do not show any decline of bovine tuberculosis in that country. Radical measures for the eradication of this infection have never been adopted, primarily because of the economic loss involved. As an alternative, it is proposed that all cows reacting positively to the tuberculin test be segregated on separate farms. As these cows show evidence of clinical tuberculosis they should be killed. Until then, the milk could be pasteurized and safely sold. The calves produced by these cows, if segregated in their own buildings and fed on heated milk, would grow up as non-reactors and would complete herds depleted by reactors.—*The Mitchell Lecture on Human Tuberculosis of Bovine Origin, W. G Savage, Brit. M. J., November 18, 1933, no. 3802, 905.*—(*T. O. R.*)

Pulmonary Tuberculosis of Bovine Origin.—Sixty-two cases of pulmonary tuberculosis with the bovine type of bacillus present in the sputum have been demonstrated. The infection may occur by the alimentary or by the respiratory route. The care of cattle involves a definite hazard for this reason. Clinically, roentgenologically, and at autopsy, "bovine phthisis" is indistinguishable from pulmonary tuberculosis of human origin. No instance of one human being infecting another with this form of disease has been observed. A man suffering from "bovine phthisis" is almost certainly a hazard to a tubercle-free herd of cattle.—*Pulmonary Tuberculosis of Bovine Origin: a Critical Survey, W. M. Cumming, Brit. J. Tuberc., October, 1933, xxvii, 150.*—(*R. D.*)

Transplacental Transmission of Tubercle Bacilli in Acute Rheumatism.—Three women developed acute rheumatic fever during pregnancy. They had no pulmonary tuberculosis with the exception of old apical scars. One woman had a tuberculide on the leg and an ostitis of the clavicle. In all 3 cases tubercle bacilli were cultured during the rheumatic disease from the peripheral blood, and in each case tubercle bacilli were demonstrated in the cord blood. The tubercle bacilli isolated were identified by animal inoculation. The children were born 3 years, one year and 5 months, and one year ago respectively. None of those children have shown any sign of tuberculosis. In spite of this the prognosis is doubtful, since tubercle bacilli may survive in the human body for a long time in a state of latency.—*Schwangerschaft, akute Gelenksentzündung, Tuberkelbacillen im Nabelschnurblut, C. Reitter and E. Löewenstein, Beitr. z. Klin. d. Tuberk., July 29, 1933, lxxxiii, 225.*—(*M. P.*)

Contact Tuberculosis in Normal and Vaccinated Rabbits.—The adult type of tuberculosis in European races is usually an exogenous or endogenous reinfection following the primary infection of infancy and childhood. A localized, nonprogressive infection with living human-type bacilli in rabbits might, therefore, serve experimentally as a primary lesion comparable to that acquired by man during childhood. If rabbits so treated, and then exposed to cage-mates infected with bovine type bacilli, were to develop progressive tuberculosis, the lesions could be identified by isolating the causative agent in pure culture and determining its type. Preliminary experiments showed that the incidence of contact tuberculosis in normal rabbits exposed to cage-mates infected with bovine-type bacilli was much greater than in guinea pigs similarly exposed. Rabbits exposed to cage-mates infected with the human-type bacillus did not acquire the disease. Hence, a study was made of rabbits vaccinated with living tubercle bacilli of human type and subsequently exposed to cage-mates infected with the bovine type. Special cages were built and into each of 7 cages 8 rabbits were placed upon a metal pan having an approximate area of 6 square feet. Four rabbits were infected intravenously with 0.000,1 to 0.000,01 mgm. of a highly virulent strain of bovine-type tubercle bacilli and served as sources of contagion for the other four animals in the cage. Two of the latter were normal, half-grown rabbits free from tuberculous infection. The other 2 were rabbits of similar age that about two months previously had been given a subcutaneous inoculation of 1.0 mgm. of a virulent human-type tubercle bacillus. In these cages the normal and infected rabbits were exposed under identical conditions to infection both by way of the alimentary and respiratory tracts. To determine whether normal and human-infected rabbits would acquire tuberculosis under conditions eliminating gross alimentary infection, another cage was made, divided in two by a vertical partition which contained a screened window. Two normal and 2 vaccinated rabbits were placed on one side and 4 tuberculous rabbits on the other. The air-circulation in this cage was so arranged that warm air flowed from the sources of contagion to the contacts. The population of these eight cages was kept constant by replacing the dying animals, either the sources of contagion or the contacts, by similarly treated or normal animals. All animals were carefully examined at their death. The experiment was continued for over one year; and at the end of this time all the remaining contacts were killed and a careful autopsy performed on each of them. A diagnosis of tuberculosis in "normal contacts" was invariably confirmed by stained smears. The lesions of animals that had a primary (vaccinating) infection with human tubercle bacilli before exposure were either cultured or inoculated to determine whether of exogenous (bovine) or endogenous (human) origin. In most cases the primary (vaccinating) human infection was completely localized and the affection of the lymph nodes was transitory. In a few instances inconspicuous caseous centres were found in the lungs and kidney. Rarely was there an encapsulated pus pocket in the lung. The primary lesion, however, usually contained living bacilli even one year after inoculation. Tuberculosis was acquired by some of the contacts, either the

normal or the vaccinated, or both, in each of the 8 cages. The incidence and course of the acquired disease was no different in the eighth cage where the contacts were separated from the sources of contagion by a fine screen. Out of a total of 30 normal rabbits exposed for periods varying from 53 to 432 days, with an average exposure of 200 and a mean exposure of 155 to 163 days, 22 or 73.3 per cent developed tuberculosis. Among 30 vaccinated rabbits exposed for periods varying from 56 to 473 days, with an average exposure of 218 and a mean of 196 to 217 days, 18 or 60 per cent acquired tuberculosis. In the remaining 12 rabbits of this group, either there were no lesions beyond the site of vaccination, or if lesions were present they were caused by endogenous spread from the primary lesion, as shown by recovery from them of human type bacilli. Thus 40 per cent of the vaccinated and 27 per cent of the normal rabbits escaped bovine contact infection. Within the first 100 days of exposure 33 per cent of normal rabbits as against 20 per cent of vaccinated rabbits acquired bovine tuberculosis. When exposed from 101 to 200 days the ratio was 66 per cent to 33 per cent respectively. However, later the resistance of the vaccinated rabbits waned, for by the end of the year altogether 60 per cent had developed tuberculosis. The incidence of acquired tuberculosis increased with an increase in the number of animals to which the contacts were exposed as the sources of contagion that died of tuberculosis were replaced. No constant relationship was noted between the extent of the primary lesion of vaccination and the incidence of acquired tuberculosis. Nor was there any constant relationship between the incidence of the disease and the interval elapsing between vaccination and exposure. With regard to the portal of entry 14 normals and 8 vaccinated had only a respiratory portal, 3 normals and 1 vaccinated had both respiratory and alimentary portals, and 5 normals and 9 vaccinated had only an alimentary portal. Thus alimentary infection was more common among the vaccinated animals, and respiratory infection among the normal animals. The acquired disease was much more extensive in the previously normal animals than in the vaccinated ones. The kidney was affected in 14 and the bone-marrow in 4 of the 22 normal contacts that acquired tuberculosis, while the kidney was affected in 7 and the bone-marrow in 1 of the 18 vaccinated contacts that acquired tuberculosis. In normal animals the lymph nodes draining the site of the primary acquired infection, whether in the respiratory or the alimentary tract, were affected in each of the 22 that developed the disease. In the vaccinated animals, on the contrary, these nodes were involved in only 6 out of 18 rabbits. Out of the 30 normal contacts 11 died of tuberculosis after an average duration of exposure of 198 days, with a range from 122 to 317 days. Out of 30 vaccinated contacts 7 died of tuberculosis after an average exposure of 286 days, with a range of from 195 to 375 days. The mortality in the vaccinated contacts was 13.3 per cent less than in the normal contacts. Thus the difference between the two groups in mortality is of the same magnitude as the incidence of the disease. The vaccination reduced the incidence, extent and mortality of the disease, affected the route of infection, changed its pathological character and retarded its progress. The disease acquired by vaccinated rabbits shared many characteristics with adult type of tuberculosis in man.—*Experimental Epidemiology of Tuberculosis. The Effect of a Primary Infection on Contact Tuberculosis in Rabbits, M. B. Lurie, J. Exper. Med., September, 1933, lviii, 305.*—*(J. S. W.)*

Experimental Blood-Stream Infections with Tubercle Bacilli.—A human strain of tubercle bacilli was obtained from one guinea pig of a group of five inoculated with pus from a patient with tuberculous adenitis. Blood from another of this group when inoculated into other guinea pigs produced tuberculosis only in those animals treated with an acetone extract of Koch's bacilli. Rabbits inoculated with cultures from one of the originally infected but untreated guinea pigs did not develop tuberculosis. However both rabbits and guinea pigs inoculated with cultures made from one of the treated guinea pigs showed tuberculous lesions. Chickens inoculated with the same cultures remained uninfected. Cultures made from the treated guinea pigs and the infected rabbits yielded the same type of tubercle bacilli in the final result.—*Sur la bacillémie du cobaye tuberculeux, L. Nègre Compt. rend. soc. biol., January 20, 1934, cxv, 283.*—*(M. T. W.)*

***BCG* Vaccination Results.**—The authors present two groups for consideration in order to show the difference between children of tuberculous families after vaccination and without vaccination with *BCG*. One group consisted of children vaccinated orally with *BCG* and all those used as controls which entered the study from birth. Of this group those who had *BCG* showed a lower death-rate from tuberculosis than similar controls. There was no evidence, however, to indicate that the vaccination conferred any "paraspecific" immunity, the

death-rate from nontuberculous conditions not being appreciably lower than in the control group. The other group was composed of children who were not known from birth, but who had a negative reaction to tuberculin in amounts up to 10 mgm. when first examined and who received *BCG* parenterally. All came from tuberculous families. Control groups to this were children of tuberculous families with negative Mantoux reactions who were not vaccinated, and a group of similar children who were tuberculin reactors. In this second study the children parenterally vaccinated with *BCG* did not show any mortality from tuberculosis, while controls with negative Mantoux reactions had a death-rate of 1.4 per cent against a death-rate of 3.2 per cent among those with positive initial Mantoux reactions. There was no appreciable difference in the mortality of the controls who had negative roentgenological findings in the chest when they were first seen, whether they had negative or positive initial tuberculin tests. Roughly, the exposure was the same in the three groups and affected the parenterally vaccinated children from three months prior to the inoculation, and the controls who had negative initial Mantoux reactions, from three months prior to the first test, while the exposure in the group with a positive initial tuberculin test was considered only from the date of the initial positive reaction. The only conclusion can be that the mortality from tuberculosis among children vaccinated with *BCG* is definitely lower than that for corresponding controls. Tuberculin tests performed on 148 nonvaccinated children, followed up since birth, and on 205 children orally vaccinated with *BCG* before their tenth day showed, during the first two years of life, from 20 to 40 per cent more positive Mantoux tests among the latter cases. The allergy produced by *BCG* apparently does not usually last for more than two or three years. Comparatively few of the control children developed positive reactions to tuberculin, even when they were more or less exposed to open tuberculosis, that is, 20 per cent in the first year and 50 per cent up to the fourth year. If repeated tuberculin tests are performed through the years, a small percentage of the slightly or moderately positive reactions become negative. A further investigation by the authors was made consisting of three main experiments. An attempt was made to detect any appreciable increase in the virulence of *BCG* under special methods of cultivation and animal inoculation. A study was made to determine whether any change in the virulence of *BCG* developed during residence in the human body for different periods. Observations were made on the development of an increase or a decrease in resistance to tuberculous infection developed after vaccination with *BCG*. The results indicated that *BCG* is so attenuated that even under the most favorable conditions of artificial cultivation it is difficult to increase its virulence to any degree. During five years, its virulence was tested in 165 rabbits and 194 guinea pigs, but no evidence was found of any increase in virulence. Twenty cultures of acid-fast bacilli that were recovered from the cold abscesses of 17 children after from one to six months' stay in the body showed no increase of virulence, but remained like the *BCG* in colony morphology and were nonvirulent for rabbits and guinea pigs. Pathological material obtained from children who were vaccinated with *BCG* and died of other infections showed no evidence that *BCG* tended to increase in virulence during its residence in the human body. The authors do not think that slight primary tuberculous infection acquired by natural infection or produced by vaccination diminishes resistance against future superinfections by tuberculosis.—*Effect of Vaccination with BCG on Children from Tuberculous Families, W. H. Park, C. Kereszturi and L. Mishulow, J. Am. M. Ass., November 18, 1933, ci, 1619.*—(G. L. L.)

Comparative Antigenic Value of Tuberculins and *BCG*.—By means of the complement-fixation reaction the production of antibodies was studied in serum of guinea pigs injected repeatedly subcutaneously or intraperitoneally with Koch's BE, Old Tuberculin (bovine), Phymatin, Diophtin or *BCG*. It was found that injections with BE produced antibodies which reacted with the homologous antigen and with antigen prepared by treating bovine tubercle bacilli with acetone or with ethyl formate, adding 0.2 per cent of lecithin, but failed to react to Old Tuberculin except after repeated intraperitoneal injections of the antigen. No antibodies were present in the serum of the guinea pigs injected with Old Tuberculin, while in the serum of guinea pigs treated with Phymatin, antibodies were demonstrable only after repeated injections. The serum of guinea pigs treated with Diophtin reacted with the acetone and ethyl-formate antigen, and to a less degree with Old Tuberculin, but failed to react with the homologous antigen. In the serum of guinea pigs treated with *BCG* complement-fixing, antibodies which reacted with *BCG*, acetone and ethyl-formate antigen and with Old Tuberculin were demontrable within ten days after injection. It is concluded that, based on their ability to produce antibodies, the order would be *BCG*,

BE, Diophtin, Phymatin and Old Tuberculin. For the demonstration of complement-fixing antibodies tubercle bacilli treated with either acetone or with ethyl formate constitute the best antigens.—*Über die antigene Wirkung verschiedener Tuberkuline im Vergleich mit BCG, J. Sal, Zentralbl. f. Bakt., February, 1934, cxxxi, 103.*—(*J. D. A.*)

Attempts at Increasing Virulence of *BCG*.—*BCG*, cultured on Sauton's, glycerin-potato, or Calmette's medium is consistently avirulent. However it is not a virus fixe, for by repeated culture on egg media of Petroff, Petragnani and Hohn, "R" and "S" variants occur, which attain a considerable increase in virulence. This was particularly true of "S" variants of *BCG* cultured on Hohn's medium, on the addition of sodium taurocholate. Yet, while some rabbits died from generalized tuberculosis, and, while the organism was recovered in culture and could be passed on to a second rabbit, the third passage was unsuccessful. Such results were only obtained by the use of very large doses (15 mgm.) and only by intravenous inoculation; the rate of multiplication or virulence of the *BCG* could not be consistently increased by continuous exposure to mitogenetic rays from cultures of *B. coli*. The second inoculation of *BCG* into rabbits which had received from a quarter to a half a year previously a large dose of the same organism, did not result in an increase in its virulence.—*Variationen bei Bakterien. I. Experimentelle Versuche zur Steigerung durch Dissoziation auf Eier-Nährböden und durch mitogenetische Bestrahlung, F. Sullivan, Ztschr. f. Immunitätsforsch., 1933, lxxxi, 1.*—(*M. B. L.*)

Action of Bile Salts on Tubercle Bacilli.—Cultures of tubercle bacilli were shaken for two minutes in a solution of bile salts approaching the lethal concentration of from 1 to 2 per cent, in broth or physiological salt solution, and were left to stand for varying lengths of time. Two hundred milligrams of tubercle bacilli were used for each 100 cc. of bile-salt solution. The suspensions were centrifugated, washed, and various media seeded in the proportion of 25 mgm. to each culture-tube. The cultures were left to grow at room temperature or in the incubator at 38°C. Following this treatment the biological characteristics were definitely altered in most strains. In general, the exposure to bile salts tended to change the cultures from the *R* type of colony to the *S* type. Some of the first transplants were moist and viscous but became typically smooth colonies on subsequent transplants. Occasionally the treated cultures gave *R* type of colonies. The results were inconstant and unexplainable without further experimentation.—*Modification des cultures de bacilles tuberculeux sous l'influence du glycocholate de soude, I. Lominski, Compt. rend. soc. biol., March 3, 1934, cxv, 929.*—(*M. T. W.*)

Vaccination against Tuberculosis by Inhalation of Tubercle Bacilli.—A series of rabbits received inhalations of killed, young tubercle bacilli. This treatment was well borne by the animals. After varied intervals these rabbits and untreated rabbits were infected with virulent bovine bacilli by inhalation. The treated rabbits proved to be definitely more resistant than the controls.—*Untersuchungen über Immunisierung gegen Tuberkulose durch Inhalation von abgetöteten Tuberkelbacillen, N. Westenrijk, Beitr. klin. d. Tuberk., October, 1933, 515.*—(*M. P.*)

Vaccination with Heat-Killed and Formalinized Tubercle Bacilli.—Recently it has been shown that formaldehyde reduces the toxicity of certain animal and vegetable toxins without influencing their antigenic properties. Hence it can be used for "detoxifying" bacterial vaccines. The following experiments were undertaken to compare the effects of a vaccine prepared from formaldehyde-treated tubercle bacilli with one made from heat-killed bacilli. Studies were made of the immunizing power, of the skin-sensitizing power, and of the rapidity of absorption of the two vaccines. An examination of the lesions produced by the intravenous injection of heat-killed tubercle bacilli was also made. Rabbits were used in all the experiments. The vaccines were made from B1 bovine tubercle bacilli. The formalin-killed vaccine was made by suspending the organism in an aqueous solution of 0.4 per cent formaldehyde and 0.9 per cent sodium chloride and incubating at 37° for ten days. The organisms were then washed with distilled water to remove the formaldehyde and resuspended in physiological salt solution. The heat-killed vaccine was prepared by suspending the organisms in physiological salt solution and heating at 70° for one hour. The vaccines were given intravenously in two series of injections. The first series, four months before injection, consisted of 10 doses of 1.3 mgm. each, given at two-day intervals. Ten rabbits received the formalin-killed vaccine and 5 rabbits the heat-killed vaccine. As three of the former group died at varying times before the vaccinating course was completed, two rabbits were added before the second series of injections. Altogether 9 rabbits received intravenous formalin vaccine. The rabbits receiving heat-killed

bacilli did not stand the vaccine well, three dying of tuberculous pneumonia and one of snuffles during the course of the injections. As a result of the loss of so many rabbits the intravenous route of injection was discarded in favor of the subcutaneous route for further administration of the vaccines. Five normal rabbits were added to the formalin-vaccine group and all were infected at the same time with virulent bovine bacilli. They then received a series of subcutaneous injections of formalin vaccine during the course of the disease, starting at the day of inoculation and repeated at monthly intervals up to the fourth month, when injections were given at weekly intervals. Eight doses of 0.1 mgm. were given in all. Normal animals infected at the same time and receiving no vaccine served as controls. In another experiment one group of rabbits was vaccinated with heat-killed bacilli and another with formalin-killed bacilli subcutaneously at ten-day intervals before infection. Five doses of 0.1 mgm. were given to each. The mean longevity of each of the groups of vaccinated rabbits and the controls was determined. The rabbits which were vaccinated subcutaneously with heat-killed bacilli survived much longer than their controls, while in none of the other groups was the survival as long as that of their controls. During the first three months of the disease, 25 per cent of the controls, 44 per cent of the formalin-killed vaccine group, and 20 per cent of the heat-killed group died. The effect of the vaccine was thus more apparent in slowing down the chronic phase of the disease than it was in preventing deaths from occuring in the first, acute phase of the disease. Despite the increased longevity of the heat-killed vaccinated group, the lesions found at autopsy were similar, both in extent and type, to those found in control animals of the same survival. The acquired resistance to tuberculosis in rabbits apparently manifests itself in the ability of the treated animals to retard the rate of progress of the disease, rather than in their ability to modify or heal the lesions. The rate of absorption of the two vaccines when injected under the skin appeared similar. Both produced soft, fluctuating masses which required one to two weeks for absorption. Sections of these masses showed them to be typical of tuberculous tissue undergoing caseation. The skin-sensitizing ability of the two vaccines appeared to be equal. Two groups of guinea pigs were injected intraperitoneally with three doses of 2.5 mgm. of heat-killed and formalin-killed vaccine respectively. All of the guinea pigs became sensitive to tuberculoprotein (MA-100), and no significant difference between the two groups could be detected. Following the intravenous injection of heat-killed tubercle bacilli, it was found that rabbits developed a massive tuberculous pneumonia. Ten rabbits were given two series of intravenous injections of heat-killed bacilli and the resulting lesions examined. A study of the production and ultimate absorption of the cellular exudate showed that these processes were similar to those found after the injection of living bacilli. The lesions following heat-killed bacilli differed from the lesions found in active tuberculosis in that in any one animal they showed a striking uniformity in appearance, while in the active disease the lungs showed a great diversity in type of lesions. Studies of the blood cells during the period of injection of dead organisms showed that the changes which are characteristic of true tuberculous pneumonia were faithfully reproduced. In a rabbit sacrificed two months after the last injection of heat-killed bacilli, the lungs showed no pneumonic lesions, but a number of isolated tubercles persisted, scattered rather uniformly through the entire parenchyma, regression and absorption having taken place with practically no caseation. In true tuberculous pneumonia in the rabbit, caseation and regression occur simultaneously, but many of the lesions regress in a manner entirely similar to that after the injection of dead organisms.—*Vaccination with Heat-Killed and Formalinized Tubercle Bacilli in Experimental Tuberculosis, R. M. Thomas, J. Exper. Med., August, 1933, lviii, 227.—(J. S. W.)*

Tuberculosis in Infancy.—The ultimate fate of infants under 2 years of age who have pulmonary tuberculosis is difficult to prognosticate. With earlier diagnosis made possible by the wider use of the tuberculin test and roentgenographic examination, and by means of careful follow-up observations extending over long periods of time, one must conclude that the generally bad prognosis commonly given in children under 2 years of age undoubtedly should be modified. Early reports based almost entirely on hospital statistics exaggerated the mortality of the disease in this early-age period. In the present study 7 infants with pulmonary tuberculosis were observed for a period of four to five years. Their ages ranged from 7 to 22 months when first seen. The diagnosis of tuberculosis was suspected on the basis of known exposure in all cases, frequent respiratory infections, anorexia and failure to gain weight properly. When first seen 5 of the 7 patients had areas of dulness and diminished breath-sounds in the chest. Lymphadenopathy or enlargement of the spleen were not constant findings. X-rays of the chest

revealed 3 types of lesions: (1) massive lung shadows which slowly became smaller in time—the type that has been termed "epituberculosis"; (2) smaller and less sharply circumscribed shadows with mottling of the lungs elsewhere; and (3) similar pictures with evidence of pleurisy in addition. Three of the children developed tuberculous lesions of skin or bone. One died of tuberculous meningitis. The clinical course, under treatment with rest, heliotherapy, codliver oil, and, in 2 cases repeated transfusions, was strikingly similar in all cases. It was characterized chiefly by a poor and irregular weight-gain. Fever was not always present, even in the early stages of the disease. At the time of the report four of the children were considered well and two still had clinical and roentgenological evidence of tuberculosis. Pulmonary tuberculosis in infants under 2 years of age is not necessarily fatal, but even after a long period of observation a very guarded prognosis should be given. *Tuberculosis: II. Pulmonary Tuberculosis in Infants Under Two Years of Age; a Report of Seven Cases and Discussion of the Course of the Disease, Ethel C. Dunham, Am. J. Dis. Child., January, 1934, xlvii, 149.*—*(M. D.)*

Spontaneous Pneumothorax in Newborn.—Partial spontaneous pneumothorax of the newborn has not heretofore been recognized as a cause for the onset of dyspnoea and cyanosis in small infants. The routine taking of roentgenograms over a period of a year and a half, in all instances in which newborn infants manifested unexplained respiratory and circulatory distress, led to the discovery of 3 cases of partial spontaneous pneumothorax occurring within the first week of life. Thus, the condition far from being a rarity, practically unknown in medical history or practice, must be one of not infrequent occurrence. In all 3 cases reported, the babies were delivered spontaneously at term, but only once were the symptoms of dyspnoea and cyanosis present from birth, and in this particular case these symptoms at birth were due to congenital atelectasis of the lungs, and only later did spontaneous partial pneumothorax supervene. Furthermore in this infant partial pneumothorax developed silently after all the signs of respiratory distress from the atelectatic condition of the lungs had vanished, so that air in the left pleural cavity was an incidental finding on X-ray examination, and existed without apparent clinical significance. In the other two infants dyspnoea and cyanosis developed on the fifth day of life. An X-ray plate taken of one of these two infants on the ninth day of life revealed a partial pneumothorax on the right, and an enlarged thymus. The subsequent course in this child is of interest in that, following a period of improvement, an exacerbation of symptoms occurred, and a second X-ray plate taken on the twelfth day of life showed a partial pneumothorax now on the left, with resorption of the one on the right. In the other child cyanosis and dyspnoea developed on the fifth day of life coincident with fever and signs of a pulmonary infection. Roentgenographical examination revealed a partial pneumothorax on the left. The pneumothorax present in all three children had vanished by the 22nd day of life, the minimum known duration being three days, the maximum twelve days. The mechanism of the production of a partial pneumothorax in the newborn is not known. Sudden forceful breathing leading to emphysema and a ruptured alveolus is probably a common sequence in the production of this condition. Thus it is advisable to refrain from too drastic methods of initiating respiration in newborn infants. An enlarged thymus may play a part. Occasionally, as in the first case cited, a partial pneumothorax may develop silently as an indirect result of other disturbances in the respiratory or circulatory systems, and without X-ray evidence it may be completely masked by the primary condition, or wholly missed because of lack of clinical signs or symptoms. On account of the possibility of obtaining specific therapeutic aid by the withdrawal of air from the pleural cavity in cases of pneumothorax, roentgenograms should be taken of all infants manifesting respiratory or circulatory distress.—*Ueber partiellen Spontanpneumothorax beim Neugeborenen, A. Hotz, Schweiz. med. Wchnschr., lxiv, March 10, 1934, 209.*—*(V. T.)*

Pulmonary Tuberculosis in Childhood.—Phthisis is rare in childhood. Furthermore, pulmonary tuberculosis is not often the cause of delicacy in childhood in England. There is no definite evidence that primary infections which do not produce demonstrable lesions have any ill effect upon a child's health. X-ray examination may reveal calcified foci or nodes, often found in children in good health. Excluding these cases six varieties of pulmonary tuberculosis may be recognized as follows: *benign group:* (1) tuberculous adenitis and "epituberculous" manifestations; (2) chronic miliary tuberculosis; and (3) tuberculous pleurisy with effusion: *serious group:* (1) acute miliary tuberculosis; (2) tuberculous pneumonia; and (3) adult type of phthisis. Mediastinal adenitis is only visible when the nodes are grossly enlarged or calcified. The association of parenchymatous or pleural

exudation with lymph-node enlargement, however, is frequent. This may give the appearance of a flame-shaped opacity near the hilum, due to a perifocal reaction around the nodes or to obstruction of the lymphatic vessels converging on the root. An interlobar pleurisy may be present. In "epituberculosis" the physical signs are those of a lobar consolidation which usually involves the right upper lobe. It is seldom accompanied by symptoms of acute disease and its course is chronic. There is no respiratory distress, and neither the fine crepitations of incipient nor the coarse crepitations of resolving pneumonia are heard. The skin test is strongly positive, and tubercle bacilli have been recovered from stomach washings and from exploratory puncture of the lung. The process resolves, leaving a perfectly healthy lung or in some instances slight evidence of parenchymatous scarring. The pathological basis of "epituberculosis" is much debated. It may be an exudative response or an atelectasis due to compression of a main bronchus by an enlarged node. The results of the few postmortem examinations that have been made are conflicting.—*Clinical Manifestations of Pulmonary Tuberculosis in Childhood, W. B. Wood, Lancet, October 7, 1933, ccxxv, 797.*—(*R. D.*)

Open Tuberculosis in Children.—The most successful method of demonstrating tubercle bacilli in children with pulmonary lesions is by culture of the gastric contents. One hundred and ten children have been so examined repeatedly. According to clinical criteria, 77 patients were active and 34 were inactive. Of the active cases, 24 showed tubercle bacilli in the gastric contents. Out of 8 infants, 7 were positive. All patients with tuberculosis of the bronchial lymph nodes and without demonstrable parenchymal lesions did not show tubercle bacilli of the gastric contents. The epidemiological significance of these findings is discussed.—*Offene Tuberkulose im frühen Kindesalter, F. Strunz, Beitr. z. Klin. d. Tuberk., December, 1933, lxxxiv, 206.*—(*M. P.*)

X-Ray Examination of Apparently Healthy Children.—In the course of a study of 35,000 school children, including 9,000 of high-school age, 14 cases of adult tuberculosis, or 1 per cent of the enrollment, were found in one high-school. In only one of these cases were physical signs and symptoms such as to lead to investigation as to the existence of tuberculosis. In one case it appeared that a girl of sixteen, of athletic type, but with advanced tuberculosis, had infected five other girls. The adult type was rarely found in grade-school children, but occurred in 0.5 per cent of high-school pupils. It is suggested that in the examination of apparently healthy children the program be started with the high-school age.—*The Value of the Roentgen Ray in Apparently Healthy Children of School Age, D. S. Brachman, Am. J. Roentgenol. & Rad. Ther., 1933, xxx, 303.*—(*E. R. L.*)

Diagnosis of Tuberculosis in Children.—The diagnosis of pulmonary tuberculosis in children is frequently made without sufficient evidence. It must be stressed that primary tuberculous infection is benign, that phthisis in children aged 3 to 12 years is very rare, and that chronic nontuberculous infection of the lungs at this age is very common. A survey was made of 100 children between 5 to 14 years of age who had been admitted to the City of Leicester Sanatorium. Of these children 58 reacted to tuberculin. However, in most, if not all, of these 58 children the tuberculous infection was obsolescent. In only one child of the entire group of 100 was evidence of recent tuberculous disease obtained. The remaining 99 children had a revisional diagnosis of chronic pulmonary catarrh which included the nontuberculous catarrhal and fibrotic processes secondary to severe measles, whooping cough, or bronchopneumonia; chronic bronchitis; and malnutrition and debility from various causes other than a respiratory lesion. Therefore, more attention should be paid to the efficient treatment of the acute lung lesions. These patients should have a prolonged period of convalescence at an open-air school rather than at a sanatorium.—*Chronic Pulmonary Catarrh and Fibrosis in School Children, H. S. Banks & J. H. Weir, Tubercle, June, 1933, xiv, 385.*—(*T. O. R.*)

Resolving Tuberculous Exudates in Childhood.—This clinical and roentgenological study of tuberculosis in childhood supplements a previous report. In that paper pathological evidence was presented to show that the massive pulmonary shadows which are frequently seen in tuberculosis and which disappear in time, are to be regarded not as "toxic" or allergic or "epituberculous" reactions to a neighboring or central "true" tuberculous lesion, but rather as due to the presence of tuberculous pneumonia which subsequently resolves. Frequent roentgenograms were depended on in the study of these cases. The final diagnosis must usually be made in retrospect as there is no way of prognosticating early whether the exudate is destined to resolve or to progress to a frankly caseous pneumonia. In the former case physical signs of consolidation and serious constitutional symptoms may be present, but

improvement occurs when once the process has reached full bloom; whereas in caseous pneumonia the patient gradually declines and passes into the cachectic stage unless a complication, such as miliary tuberculosis, ends the course acutely. This, however, is not a clinical differentiation of two different entities, but merely a difference in the course of the same disease, tuberculous pneumonia. Only the observation of a child over an extended period of time permits one to venture a dependable opinion as to the outcome. —*Resolving Exudates in Pulmonary Tuberculosis of Childhood, H. S. Reichle, Am. J. Dis. Child., November, 1933, xlvi, 969.*—(*M. D.*)

Complement Fixation in Tuberculous Children.—About 30 modifications of complement-fixation tests for the serological diagnosis of tuberculosis with various antigens have been published, yet none has reached the importance of the Wassermann test in syphilis. In tuberculosis what is required is not so much a specific, diagnostic serological test as a differentiation between active and inactive tuberculosis, because the tuberculin test already enables one to diagnose tuberculous infection. In a series of complement-fixation tests in children the Leuchtenberger and Lorenz method was used. This method is characterized by the fact that, instead of the amboceptor from rabbit serum, the haemolysins in the human normal serum are used. The technical details are given. A group of 21 children with active tuberculosis was tested. Of these 21, 15 reacted. In another series of 13 children with nontuberculous disease but with positive tuberculin reaction, 8 were negative. In still another group of 22 children with negative tuberculin reaction, 13 were negative. It is obvious from this that in nontuberculous children positive reactions occur. Complement reaction therefore is not practicable for the diagnosis of tuberculosis in children, although occult and difficult cases of tuberculosis in adults have been cleared up by this test.—*Komplementbindungsreaktion bei Tuberkulose im Kindesalter, G. Joppich, Deutsche med. Wchnschr., September 22, 1933, lix, 1466.*—(*H. S. W.*)

The Onset of Tuberculosis.—The primary *Äffect* is generally recognized as an entity and is to be distinguished from all other forms. It consists of a more or less extensive pneumonia. Slight cases may not be recognized and are certainly in the majority. Clinically there is malaise, decreased appetite and transient fever. In more aggravated cases there are symptoms of "grippe," with impaired resonance and bronchovesicular breathing. Râles appear only after softening or excavation of the focus. The X-ray picture shows a diffuse shadow of variable size which may be located in any part of the pulmonary field. It may retrogress or proceed to cavity-formation. In the former event a circular shadow develops which is connected by lines with a similar shadow at the root (bipolar stage). A positive tuberculin skin test or positive sputum clinches this structure as the site of the primary infection. All the other forms of tuberculosis are exogenous reinfections, as the so-called endogenous reinfection is really a metastatic formation. Clinically, in most cases these two forms cannot be differentiated, although an exact history may be suggestive. As to the localization of developing pulmonary tuberculosis the old viewpoint of the onset in the apical region is still adhered to by pathologists. But, on account of their smallness, these foci are not detected by the clinician, and the early infiltration is, as regards clinical diagnosis and therapy, the more important focus. The early infiltration (Redeker) is usually directly below the clavicle but may occur any where in the lung field. Its X-ray appearance is that of a circular shadow the size of a dollar and of variable density. Objective clinical findings are elicited usually only after progression has occurred, especially if cavity develops. It originates in various ways. It may represent exogenous reinfection, or bronchial aspiration from caseating material from an older apical lesion, or haematogenous metastasis. During the early stages of this early infiltration there is a "grippe-like" symptomatology and, after softening or excavation, the general condition is improved, but a cough persists; and occasional haemoptyses and positive sputum in small amounts appear. Whereas the early infiltration develops in an otherwise relatively healthy lung, other infiltrative lesions represent exacerbations or perifocal inflammation or "allergically conditioned exacerbation of labile foci." Transient infiltrations are hard to identify as being tuberculous. In haematogenous spread, lymphatic tuberculosis plays an important rôle. Frequently in haematogenous spread there are enlarged lymph nodes and in miliary tuberculosis there are, frequently, caseous tracheobronchial nodes. In miliary tuberculosis with predominance near the root, the picture resembles closely carcinomatous lymphangitis and suggests lymphatic spread. Diffuse haematogenous spread may occur in a more or less dense and extensive pattern and at various intervals. These lead to calcified foci and extensive scar-formation, to emphysema and bronchitis. In the worst

cases it leads eventually to extensive pulmonary involvement and may prove fatal in a short time. Localized haematogenous spread may occur if the bacilli invade a branch of the bronchial artery, and the X-ray shows a circumscribed focus of miliary seeding. Swelling of the spleen is also frequently encountered. Phthysis at the age of puberty is usually a mixed form, with exacerbations around older foci, formation of new foci of bronchogenic or a haematogenous origin and exogenous superinfection. Tuberculosis in pregnancy shows similar types. The acute form of pulmonary tuberculosis is represented by caseous pneumonia and tuberculous bronchopneumonia. Caseous pneumonia shows definite physical findings. The origin is found in bronchogenous aspiration or haematogenous spread of caseous material. The sputum contains tubercle bacilli. The course in both types is rapid and the diagnosis important. Every disease has its period of incubation, and in tuberculosis it has been found especially difficult to determine this period. But in some cases a positive skin reaction has been observed six to seven weeks after detection of the infection. Also, in some cases in which trauma led to tuberculous disease, a similar period of incubation has been determined. But the time varies, as it obviously depends to some degree on the number of infecting tubercle bacilli and the natural imunity of the patient.—*Über den Beginn der Lungentuberkulose, W. Curschmann, Deutsche med. Wchnschr., July 21, 1933, lix, 1127.*—(*H. S. W.*)

X-ray Diagnosis of Pulmonary Tuberculosis.—Roentgen shadows in pulmonary tuberculosis are not qualitatively distinctive. The view that they are characteristic may result in disregard of other valuable procedures in diagnosis. The distinction between chronic tuberculous and nontuberculous disease is commonly made on the basis of location of shadows in the lung. In miliary tuberculosis, where mottling occurs throughout both lungs, location cannot be a diagnostic aid; X-ray diagnosis must rest on type of shadow, which is as distinctive as any occurring in tuberculosis. Yet other lesions, such as miliary carcinoma and miliary silicosis, are responsible for shadows qualitatively similar.—*The Type and Location of Roentgen Shadows in the Diagnosis of Chronic Pulmonary Tuberculosis, H. A. Bray and Edward H. Levy, Am. J. Roentgenol. & Rad. Ther., October, 1933, xxx, 449.*—(*E. R. L.*)

Lateral Recumbency X-Rays.—Roentgen examination of a patient in lateral recumbency shows the upper hemithorax to be larger and the lung to be more transparent than in any other position. The hyperinflation of the lung results not only from enlargement of the chest but also from the shifting of the heart and diaphragm. Portions of the lung otherwise obscured become visible and accessible to examination. Many atelectatic areas reëxpand, producing a truer picture of the disease process. Tumor masses, cavities and fluid levels are brought into better relief. Pleural effusions appear larger, so that small amounts of fluid which might otherwise escape visualization may be viewed in this position.—*The Advantages of the X-Ray Examination of the Chest in Lateral Recumbency, E. Korol & H. A. Scott, Radiology, July, 1933, xxi, 46.*—(*T. O. R.*)

X-Ray Manifestations of Allergic Processes.—The important landmarks in the progression of pulmonary tuberculosis are signalized by acute exudative lesions whose pathological bases are tuberculous bronchopneumonias. Roentgenologically they are manifested by the characteristic shadows produced by exudative lesions. Their appearance should more often than is the case to-day suggest the diagnosis of tuberculosis, although these shadows *per se* are not pathognomonic of tuberculosis. In conjunction with the clinical and laboratory findings the diagnosis is usually made without much difficulty. But it should be emphasized that without roentgenological studies a vast number of such lesions will remain undiagnosed and even unsuspected. Whenever uninvolved pulmonary tissue is invaded by tubercle bacilli the tissue responds by acute infiltrative reactions; hence their appearance at the clinical onset of the disease (in previously infected individuals), at new focalizations and at exacerbations. These allergic reactions contain all the potentialities of complete resorption, progressive destruction and healing by fibrosis or (in some cases) by calcification. The prognosis at the onset of each such reaction must be guarded, but the possibility of definitely benign developments should not be underrated. Even if the final course is progression, the immediate development is often regressive. This explains the apparent paradox that the exquisitely chronic course of tuberculosis is composed of a series of acute phases. Most of the acute phases are followed by periods of retrogression and partial repair; and these intervening periods lend to the disease its chronic nature. —*Roentgenological Manifestations of Allergic Processes in Pulmonary Tuberculosis, M. Pinner, Am. J. Roentgenol. & Rad. Ther., 1933, xxx, 296.*—(*E. R. L.*)

Triangular Basal Shadows in Chest Roentgenograms.—One of the problems upon which light has been thrown by the use

of lipoidol is that of the so-called triangular basal shadows, that is, areas of increased density more or less triangular in outline occupying the angle formed by the heart and diaphragm on either side of the vertebral shadow. Singer and Graham in 1926 identified these shadows as atelectatic bronchiectatic lower lobes, verifying the diagnosis at operation. By the use of lipiodol Richards confirmed their results. He believes that the condition may occur in accessory lobes, but also in entire lobes of the normal arrangement.—*The Interpretation of the Triangular Basal Shadows in Roentgenograms of the Chest, G. E. Richards, Am. J. Roentgenol. & Rad. Ther., September, 1933, xxx, 289.*—(*E. R. L.*)

Lipiodol in Bronchography.—In most cases lipiodol, remaining in the lungs after introduction for roentgenography, is gradually discharged through the bronchi. Direct absorption through the lung occurs only to a slight degree, if at all. A slight exudative reaction usually occurs about deposits of lipiodol in the healthy lung but this seems not to be harmful in the clinical sense. The transudation of oedema fluid may be considerable and this may account for the rapidly developing roentgenographic lobar opacity report by some authors. Lipiodol may be retained for days, months or years in the pulmonary alveoli. From the roentgenological point of view, this "contrast medium infiltrate" is a diagnostic disadvantage. The persisting densities may impair the value of serial roentgenograms as guides for treatment. Disadvantages and dangers peculiar to the cricothyroid or transtracheal method of injection include the escape of oil into and indefinite retention in the cervical and mediastinal tissues; the more or less serious infection of these tissues by escaping bronchial discharges; and, less often, pain, dysphonia, oedema of glottis, dysphagia, subcutaneous emphysema and air embolism. Iodism is due mostly to the swallowing of the oil and absorption of iodine through the intestine. Usually it can be avoided by carefully injecting the oil in small amounts, adopting measures to prevent retention in the lungs, postural drainage of the bronchi after bronchography, and finally the administration of a brisk saline purge. In cases of infectious pulmonary disease, mainly tuberculosis and acute or chronic suppurative conditions, dissemination or aggravation can be caused by lipiodol injection.—*Lipiodol in Bronchography. Its Disadvantages, Dangers and Uses, J. Burns Amberson, Jr. and H. McL. Riggins, Am. J. Roentgenol. & Rad. Ther., December, 1933, xxx, 727.*—(*E. R. L.*)

Tubercle Bacilli in Pleural Effusions.—Tubercle bacilli were demonstrated by cultural methods in 84.4 per cent of 51 cases. In effusions with a specific gravity of more than 1020 they were found in 100 per cent of the 41 cases and in 94.8 per cent, and in none in which the specific gravity was less than 1020. This applies both to so called idiopathic pleuritis and to pneumothorax effusions.—*Über Zchtung von Tuberkelbacillen aus Pleuritis-und Pneumothoraxexsudat, N. Oshima, R. Suzuki and K. Suzuki, Beitr. z. Klin. d. Tuberk., September, 1933, lxxxiii, 441.*—(*M. P.*)

Demonstration of Tubercle Bacilli in Diagnosis.—The examination of 69 specimens from various sources by direct smears, cultures and guinea-pig inoculations showed the cultural method to be superior for demonstrating tubercle bacilli. Twenty-four and six-tenths per cent of the cultures were positive in comparison with 10.1 per cent by direct smear and 15.9 per cent by animal inoculation. Several culture media were tested, proving Corper's, Hohn's and Miraglia's the most satisfactory. Of these three Corper's is the most efficacious because it is sufficiently sensitive and has the added advantage of becoming contaminated less readily.—*An Evaluation of Three Methods for the Demonstration of Tubercle Bacilli for Use in Hospital Routine, Nell Hirschberg, J. Lab. & Clin. Med., January, 1934, 429.*—(*M. T. W.*)

Cultivation of Tubercle Bacilli from Blood.—An experience of 14,300 blood cultures for tuberculosis should be adequate basis for discussing the possibilities of error in the procedure. Collaboration with the internist is necessary. For instance, in articular rheumatism the blood should be cultured when there is no possibility that salicylic acid circulates in the blood. Cultures from the blood and also articular fluid in acute and chronic polyarthritis contained tubercle bacilli as did the blood from erythema nodosum, chorea, dementia praecox, multiple sclerosis and neuritis retrobulbaris. —*Über Fehlerquellen beim kulturellen Nachweis der Tuberkelbazillen im Blut, E. Loewenstein, Deutsche med. Wchnschr., September 22, 1933, lix, 1468.*—(*H. S. W.*)

Demonstration of Tubercle Bacilli by Gastric Lavage.—Of 622 children with positive tuberculin reactions, 199 showed the presence of tubercle bacilli in the material obtained by gastric lavage. At least two and preferably three or more lavages should be examined before the material is considered free from bacilli. The younger the child the

greater is the possibility of positive findings. During the first year of life 87 per cent of tuberculin-positive children discharged bacilli; during the second year 46 per cent; during the fifth year 25 per cent; and during the ninth year 14 per cent. By this method the diagnosis of active tuberculosis was made in the 15 per cent of children who showed no roentgenographic or auscultatory signs of pulmonary involvement. Of the children whose cases were subsequently followed up, 21 per cent of those in whom bacilli had been found died of tuberculosis, compared with only 5 per cent of the tuberculin-positive group in whom no bacilli were demonstrated. Children who are discharging bacilli should be considered infectious, and, irrespective of the clinical status, isolation or at least withdrawal from school should be carried out.—*Four Years' Experience with Examination of Material Obtained by Gastric Lavage: I. Demonstration of Tubercle Bacilli and its Significance in Prognosis, Therapy and Estimation of Danger of Infection, V. Poulsen & A. O. Andersen, Am. J. Dis. Child., February, 1934, xlvii, 307.*—(*M. D.*)

Demonstration of Tubercle Bacilli by Gastric Lavage.—A large series of tests have been made at the State Serum Institute in Copenhagen, in a search for tubercle bacilli in the gastric contents of patients with suspected tuberculosis whose sputum is free from bacilli. After several alterations since the investigation was begun in 1928, the following method is employed: From 200 to 300 cc. of the material obtained by gastric lavage is allowed to stand from eighteen to twenty-four hours, after which the sediment is centrifugated, and smears are made for microscopical examination. The remainder is divided into two portions, one of which is homogenized with 4 per cent sodium hydroxide; the other, with 6 per cent of sulphuric acid by volume. The soda homogenization proceeds at 37°C. for about twenty minutes, the glass being shaken now and then. After centrifugation at high speed for twenty minutes the supernatant fluid is removed, and the sediment is neutralized with 2 drops of 8 per cent hydrochloric acid; half of this is seeded with a Pasteur pipette in three Loewenstein tubes. The rest, together with some of the acid-homogenized material, is inoculated, partly subcutaneously and partly intraperitoneally, into a guinea-pig. For the acid homogenization about 5 cc. of 6 per cent sulphuric acid is added, and the sample after vigorous shaking is allowed to stand in darkness for five minutes at room temperature. After the addition of from 10 to 15 cc. of saline solution and brief centrifugation, the rather voluminous sediment is seeded in three tubes with a platinum loop. The rest is mixed with the part of the soda-homogenized portion that is intended for the inoculation of guinea-pigs. In all cases in which there is sufficient sediment to permit of division, this technique is used as a matter of routine, as it has been found that some strains best withstand the acid homogenization, whereas others give better results with soda homogenization. The tubes are sealed with paraffin, incubated at 38°C. and examined once a week. As soon as a culture is found to be positive, generally after from eighteen to twenty-five days, a smear is made for microscopical confirmation, and the culture is put aside for subsequent counting of colonies and perhaps determination of type. If there is no growth after six weeks, the results of cultivation are considered negative. The tubes are observed, however, for another four weeks, as a few colonies grow as late as this. In the cases in which tubercle bacilli were found, they were demonstrable by both culture and guinea-pig inoculation in 67 per cent, by growth only in 20 per cent, and by animal inoculation only in 13 per cent. Nothing was found to indicate that the bacteria isolated were less virulent than tubercle bacilli isolated from other parts of the human organism. In children under 10 years of age the number of tubercle bacilli demonstrable was much less than in older individuals. Whether the younger children are less infectious remains a clinical problem.—*Four Years' Experience with Examination of Material Obtained by Gastric Lavage: II. Demonstration of Tubercle Bacilli, Vera Lester, Am. J. Dis. Child., February, 1934, xlvii, 322.*—(*M. D.*)

Tubercle Bacilli in Stomach.—The authors have examined carefully the gastric contents of patients with pulmonary tuberculosis, and have come to some interesting conclusions regarding the demonstration of tubercle bacilli although frequent examinations of the sputum give negative results. The gastric contents are obtained in the early morning before the ingression of any food. The stomach is then lavaged with about 100 to 200 cc. of water. The combined volume is then centrifugated for one hour. To the sediment an equal volume of 4 per cent sodium hydroxide is added. After about thirty minutes in the incubator at 38°C., the digested mixture is centrifugated for another hour. The sediment from the second mixture is then smeared on slides and stained for tubercle bacilli. A total of 287 patients at both the Metropolitan and the Sea View Hospitals have been examined, excluding 14 cases with no demonstrable pulmonary pathological condition, 11 non-

tuberculous cases and 3 positive sputum cases, all of which were used as controls; the remaining 259 cases yielded on gastric examination 55 positive results, a percentage of approximately 20. The cases studied included a larger number of postoperative sputum-negative thoracoplasty cases. These yielded negative gastric results.—*Gastric Examination in Pulmonary Tuberculosis with Negative Sputum: Diagnostic Importance, D. Ulmar & G. G. Ornstein, J. Am. M. Ass., September 9, 1933, ci, 835.*—(*G. L. L.*)

Isolation of Tubercle Bacilli from Faeces.—The following method for the isolation of tubercle bacilli from faeces is recommended: About 1 to 3 gm. of faecal material is suspended in 75 cc. of sterile water and the suspension is shaken for 30 minutes and then centrifugalized and the supernatant fluid is decanted. The sediment is triturated with 50 cc. of 10 per cent sulphuric acid and shaken again for 30 minutes. The mixture is then centrifugalized and the sediment planted on media. The most successful media was the liquid medium recommended by Kirchner (*Beitr. z. Klin. d. Tuberk., 1932, lxxx, 460*) and Löewenstein's egg medium. Forty-eight faecal specimens from patients with open pulmonary tuberculosis were examined by this method. Sixty to sixty-eight per cent yielded positive results.—*Neue Methode zum kulturellen Nachweis von Tuberkelbacillen aus Stuhl, C. Kuk Choun & K. Krug, Beitr. z. Klin. d. Tuberk., October, 1933, lxxxiii, 533.*—(*M. P.*)

Isolation of Tubercle Bacilli from Faeces.—Three different methods for the isolation of tubercle bacilli from faeces were tried. In one method the faecal material is treated with a trypaflavine-sulphuric acid mixture. In the next method a trypaflavine-antiformin mixture is used, and before seeding the sediment is treated with sulphuric acid, and in the last method the faecal material is first treated with antiformin and then with sulphuric acid. Combining the results of the three methods, tubercle bacilli were isolated in 100 per cent of patients with open pulmonary tuberculosis and in 26.7 per cent of cases with "closed" pulmonary tuberculosis.—*Über die Züchtung von Tuberkelbacillen aus dem Kot, T. Ogawa, Beitr. z. Klin. d. Tuberk., October, 1933, lxxxiii, 539.*—(*M. P.*)

Serum Coagulation in Pulmonary Tuberculosis.—In 1930, Weltmann published a new technique for the determination of the destabilization of the serum under certain conditions of disease. The principle of this test is as follows: when serum is increasingly diluted with distilled water it loses finally its coagulability on heating. When calcium chloride is added to non-coagulated, diluted and heated serum it coagulates. The amount of calcium chloride which brings about this secondary coagulation varies according to the stability of the serum proteins. In sera from patients with exudative and inflammatory lesions, the coagulation takes place with considerably smaller amounts of calcium chloride than in sera of normal individuals. This test was done on the sera of 40 normals and of 272 tuberculosis patients. It was found that inflammatory and exudative processes in pulmonary tuberculosis almost always increase the coagulability, but Weltmann's statement that the coagulability was decreased in strictly productive tuberculosis could not be confirmed.—*Beitrag zur Weltmannschen Serumkoagulation bei Lungentuberkulose, T. Kaiser, Beitr. z. Klin. d. Tuberk., August 23, 1933, lxxxiii, 271.*—(*M. P.*)

Tuberculoprotein and Old Tuberculin Compared.—The present study was undertaken to ascertain the value of tuberculoprotein as a testing agent, as compared with Old Tuberculin and to determine whether human beings could be sensitized to the tuberculoprotein. Skin tests were done with O. T. and tuberculoprotein (MA100) on groups of white and colored children in Philadelphia, about 800 in all. Into one forearm 0.01 mgm. of O. T. (0.1 cc. of a 1:10,000 dilution) was injected intracutaneously and at the same time the opposite arm received 0.000,5 mgm. of tuberculoprotein (0.1 cc. of a 2,000 times dilution of the stock solution). Those who failed to react to the tuberculin at the end of forty-eight hours received 1.0 mgm. (0.1 cc. of a 1:100 dilution) of tuberculin in the same forearm. Those who failed to react to the tuberculoprotein were divided into two groups. One group received 0.005 mgm. (0.1 cc. of a 1:200 dilution) in the forearm and the second group 0.05 mgm. (0.1 cc. of a 1:20 dilution). Readings were again made after forty-eight hours. The positive reactions were arbitrarily classified as from one to four plus, a one-plus reaction showing redness and oedema not exceeding 10 mm. in diameter, and a four-plus reaction, showing oedema exceeding 15 mm. in diameter and accompanied by redness and an area of necrosis. Reactions showing redness and oedema not exceeding 5 mm. in diameter were classified as negative. In the majority of cases the intensity of the local reaction was the same with both substances. In a number of instances, however, the injection of O. T.

produced a more severe reaction, but the opposite was never true. No constitutional or other untoward effect was noted in those tested with both substances. With the weaker dosage, the results obtained with the O. T. and the tuberculoprotein were in close agreement, but with the stronger doses, up to twice as many reacted to O. T. as did to tuberculoprotein. From the fact that many negatives were thrown in the positive group on higher dosage (approximately 20 per cent) it is apparent that the weaker dosage is insufficient to determine the incidence of tuberculous infection. It has been long known that sensitization to tuberculoprotein can be induced in nontuberculous guinea pigs by a single injection of varying amounts of this material. In contrast to the antigenic nature of tuberculoprotein is the absence of this property in O. T. Any sensitization noted in guinea pigs treated intensively with O. T. is due to the broth constituents. In view of these facts it seemed desirable to determine whether the injection of tuberculoprotein into the skin of human beings would sensitize them to subsequent injections of this substance after a considerable interval of time. Therefore, those patients who failed to react to the injection into the skin of 1.0 mgm. of O. T. and of 0.05 mgm. of MA100 were retested approximately three months later by injecting simultaneously 1.0 mgm. of O. T. into the skin of one forearm, while the other forearm in one group received 0.005 mgm. of tuberculoprotein and in the other group 0.05 mgm. Approximately 9 per cent of the retested children reacted to 1.0 mgm. of O. T. and these reactions did not differ in character for those elicited by the first injection of tuberculin. Of those retested with 0.005 mgm. of tuberculoprotein, however, 23 per cent of the white children and 12 per cent of the colored children reacted, while 27 per cent of the white and 41 per cent of the colored children reacted to the second injection of 0.05 mgm. of tuberculoprotein. Moreover, the reactions following retesting with tuberculoprotein were definitely inflammatory in character (Arthus phenomenon). In some instances there developed a diffuse redness and swelling extending over the upper two-thirds of the forearm and not markedly raised above the surrounding tissue. In other instances the oedema was localized, extending over an area of 30 to 40 mm. in diameter and about 6 to 8 mm. high. The swelling began to appear within from three to five hours after the injection, reached its maximum within twenty-four hours and had subsided somewhat after forty-eight hours. With the exception of pain at the site of injection no subjective symptoms were noted. These results indicate that man can be sensitized to tuberculoprotein. The reactions obtained (Arthus phenomenon) were entirely different from those due to the allergy of tuberculosis and they occurred frequently in cases, negative to full doses (1.0 mgm.) of tuberculin, which had received a previous dose of the tuberculoprotein.—*The Comparative Value of Tuberculoprotein (MA100) and Old Tuberculin, with Special Reference to Sensitization, J. D. Aronson & R. V. Nichols, J. Immunol., December, 1933, xxv, 483.*—(*J. S. W.*)

Clinical Types of Tuberculosis.—A woman, with chronic unilateral fibroid pulmonary tuberculosis of fourteen years' duration, still has cough and sputum which contains tubercle bacilli. She has received sanatorium care, sanocrysin, artificial pneumothorax, phrenic evulsion, and thoracoplasty. Collapse therapy, however, was instituted relatively late in the course of the disease. This patient is of particular interest because of her stable emotional and mental temperament.—*Some Clinical Types of Tuberculosis. IV, L. S. T. Burrell, Tubercle, June, 1933, xiv, 394.*—(*T. O. R.*)

Clinical Types.—Following an haemoptysis a man was apparently well for eleven and a half years. At 45 years of age he had an attack of influenza. Tubercle bacilli were demonstrated in the sputum. On his recovery from this acute episode he returned to work but remained under medical supervision. A young man had repeated haemoptyses over a period of thirteen years. He then developed a pleurisy with an effusion. This improved. After three months in a sanatorium, the patient returned to work and has had no further recrudescence of his disease during the last six and a half years. A young man of 22 years developed a right pleural effusion. He recovered promptly from this but shortly after developed a left pleural effusion. This also improved. He went to Switzerland and lived a fairly normal, though quiet, life. He grew weaker and died of miliary tuberculosis with meningitis. It is possible, but by no means certain, that miliary tuberculosis would have developed if he had been kept in bed.—*Some Clinical Types of Tuberculosis, V, VI, and VII, L. S. T. Burrell, Tubercle, July, 1933, xiv, 442.*—(*T. O. R.*)

Clinical Types.—A school girl of 17 years ran an acute course of pulmonary tuberculosis. Despite a complete unilateral pneumothorax, the disease spread to the contralateral lung. The patient should have had more absolute bed-rest. Shock therapy should have been given a trial in an effort to check

the spread of the disease. A man of 22 years developed an acute pneumonic pulmonary tuberculosis. An effective pneumothorax was established and maintained for 18 months. The patient started to work and two years later was still active and asymptomatic. A boy 16 years developed miliary tuberculosis from an old caseous lesion in a pulmonary apex.—*Some Clinical Types of Tuberculosis, VIII, IX, X, L. S. T. Burrell, Tubercle, 1933,* 498.- (*T. O. R.*)

Exercise and Leucocyte Counts.—The leucocyte count of 50 tuberculous patients was taken between 9 and 10 A.M. after one hour's rest in bed, and after some exercise. Thirty-eight showed an increase after exercise (in 19 of these the increase was more than 2,000 cells); 12 cases showed a decrease after exercise. In view of the significance attached to the blood-picture in tuberculosis, the author advises that blood counts be made on patients after one hour's rest in bed.—*The Effect of Exercise on the Leucocyte Count in Pulmonary Tuberculosis, J. Kaminsky, Am. J. Med. Sc., 1933, clxxxvi, 484.*—(*M. B. L.*)

Vital Capacity and Activity in Pulmonary Tuberculosis.—In a series of 60 cases determination was made of the vital capacity, the extent of the disease as shown by physical signs and X-ray findings, and the activity as judged by the sedimentation rate of the erythrocytes. The norvital capacity in each case was calculated on five standards: standing height, sitting height, weight, chest circumference and surface area. The mean of these five readings gave the percentage deviation of the patients vital capacity from the normal. The patient's actual vital capacity was determined by a Hutchinson spirometer. By plotting the vital-capacity readings along the abscissa and the sedimentation rates along the ordinate in each case, and drawing a line between the points representing the mean of the individual readings, a relationship was shown between the activity of the disease and the vital capacity, irrespective of the amount of lung involved. If, on the other hand, the amount of lung involved was substituted for the sedimentation rate, no such relationship could be demonstrated between vital capacity and extent of disease. Thus an early active lesion will usually lower the vital capacity more than an extensive quiescent one. Evidence was not obtained to suggest that the lowering of vital capacity in active tuberculosis is due to toxic weakening of the power of the expiratory muscles.—*The Relation between the Vital Capacity and the Activity of the Disease in Pulmonary Tuberculosis, G. E. Beaumont, Lancet, October 21, 1933, ccxxv, 918.*—(*E. H. K.*)

Infiltration and Infiltrate.—In this series of three papers a critical and roentgenological differentiation is attempted between *Infiltrierung* and *Infiltrat.* These terms will be translated here as *infiltration* and *infiltrate* respectively. According to Simon and Redeker infiltration is a perifocal inflammation around single or multiple old tuberculous foci. Infiltrate, according to Assmann, is a localized caseous bronchopneumonic focus in previously healthy pulmonary tissue, which in the majority of cases is localized in the so-called infraclavicular region. The studies presented in these papers are based on observations of 119 children with infiltrations and on 104 children with infiltrates. Since the entire paper is based on a large number of single case-reports, it is impossible to present an adequate abstract of all the observations. Infiltrations are classified as hilar infiltrations in which the original focus is a hilar lymph node, in which the infiltration, however, may invade the neighboring pulmonary tissue; hilar-pulmonary infiltrations in which the original focus is located in the pulmonary tissue and in which the infiltration involves the entire drainage system to the hilar lymph nodes; pulmonary infiltrations in which the original focus is located distant from the hilar region. With the onset of an infiltration the temperature is usually elevated and the sedimentation rate is increased. Tubercle bacilli were found in the sputum in 8.4 per cent of the cases. Of all children observed, 7.6 per cent showed infiltrations, but these lesions occur in adults as well. The prognosis of infiltrations is usually good, but puberty and pregnancy aggravate the disease. In the group of infiltrates the following differentiations are made: primary infiltrates, representing active primary foci; bronchogenic infiltrates, representing lesions caused by bronchogenic spread from apical foci; daughter infiltrates which are bronchogenic propagations from previously established infiltrates; haematogenous infiltrates, and genetically undetermined infiltrates. Only the bronchogenic infiltrates of rather massive infection produce the typical Assmann foci. It is not correct to assume, as it has been done, that infiltrations are the characteristic lesions in childhood, and infiltrates those of adult life; the frequency of infiltrations and infiltrates in children is nearly the same. The sedimentation rate was normal in 20.5 per cent of all haematogenous infiltrates, but it was increased in 100 per cent of bronchogenic infiltrates. Tubercle bacilli were demonstrable in the sputum in 30.7 per cent of haematogenous infiltrates

and in 80.7 per cent to 100 per cent in bronchogenic infiltrates. The prognosis of haematogenous infiltrates is much better than that of bronchogenic infiltrates. In the differential diagnosis of these lesions non-tuberculous pulmonary infiltrations must be considered and a definite diagnosis is at times impossible. Constitutional criteria do not help materially in the differential diagnosis. —*Infiltrierungen und Infiltrate, H. Starcke, Beitr. z. Klin. d. Tuberk., August 23, 1933, lxxxiii, 292, 318, 347.*—(*M. P.*)

Infiltrative Processes in Accessory Lower Lobes.—Our knowledge of anomalies in the lobulation of the lung has been based on comparative anatomy, and, only with the advent of roentgenology and with improvements in technique, has it been possible to diagnose the presence of pathological processes in accessory lower lobes and to differentiate them from certain forms of mediastinal or costomediastinal pleurisy. All cases that have been reported in the literature concern children in whom a pneumonic infiltration or tuberculosis of accessory lower lobes was found; two instances in adults were briefly described by Fleischner. The accessory lower lobe is a rather frequent anomaly. Schaffner found that 45 per cent of all his cases had a rudimentary unilateral or bilateral accessory lobe, whereas a fully developed abnormal lobe—with equal frequency on both sides—was present in 20 per cent. The accessory lower lobe has the shape of a sloping cone which rests with its base on the diaphragmatic surface of which it occupies approximately one-third. The long, thinned-out apex is crowded in between the other lobes with its long axis toward the hilum. On account of its peculiar shape it presents itself on the film in the anterio-posterior position as a more or less dense rectangular shadow whose two short sides follow the spine and diaphragm. The hypothenuse of this triangle is a straight or laterally concave line which in the presence of infiltrations can be visualized even on the left side through the cardiac silhouette. It is supplied by one bronchus which on the right side arises ventro-medially from the main-stem while on the left side it branches off from the medial branch of the second ventral bronchus. In the roentgenological literature this triangular shadow has been discussed for many years. The general consensus has been that it is pathognomonic for mediastinal pleurisy. The problem was finally solved by Graeberger and Fleischner, who independently from each other demonstrated the intrapulmonary localization of the underlying process. Differential diagnostic points are the shifting of the shadow before the screen on slow rotation, its displacement on deep inspiration toward the base and opposite to the movement of the ribs and the demonstration of a band of decreased density corresponding to the bronchus which becomes visible if the lobe is infiltrated. In doubtful cases the diagnosis can easily be made by bronchoscopy. Four case reports with good radiograms serve to bring out the clinical and radiographic characteristics of infiltrated accessory lower lobes. Because of its unfavorable basal localization and its long narrow apex ventilation of the accessory lower lobe is obviously difficult and insufficient respiratory movements cause deficient circulation of blood and lymph especially in the presence of infiltrative processes. The extremely chronic course and all other symptoms are explained by intermittent or permanent stenosis of the only bronchus through which sputum can be evacuated. The accessory lower lobe is therefore frequently the seat of extensive peribronchitis and bronchiectasis. The most characteristic clinical signs are febrile periods accompanied by a dry cough and sputum retention. Symptomatic treatment is of little value. The chronic course, the frequent exacerbations and the development of bronchiectasis raise the question of surgical interference, such as ligation of the pulmonary vessels and total extirpation of the diseased accessory lobe.—*Klinische Beobachtungen über die infiltrativen Prozesse des Lobus Inferior Accessorius., E. Regenbogen, Klin. Wchnschr., January 16, 1934, xiii, 13.*—(*M. P.*)

Epituberculous Infiltration.—The well-known literature on the subject is reviewed and a case is reported. Epituberculous infiltration is a perifocal inflammation in which the focus is situated not in the lung but in the hilum lymph nodes. It occurs in allergic individuals with an exudative diathesis.—*L'Infiltrazione epitubercolare, D. Bettini, Tubercolosi, February, 1933, xxv, 37.* —(*U. E. Z.*)

Focal Cell Reactions in Tuberculosis. —There are two infectious bovine diseases which have many characters in common and many divergent. Bovine tuberculosis and paratuberculosis (Johne's disease) are sufficiently alike to have induced the first students of paratuberculosis to describe it as tuberculosis. Both are caused by an acid-fast bacillus. Only when the bacillus could not be cultured on media on which bovine tubercle bacilli will multiply, and when laboratory animals failed to respond to inoculation, was the nonidentity recognized. A comparative study of the lesions of the two

bovine diseases supplemented by the isolation and culture of the two types of acid-fast bacilli suggested certain inferences which form the basis of this lecture. Several other diseases have been drawn into the comparative study, and the result, in the author's own words, is a "kind of rounding up of miscellaneous observations." The course of the two bovine diseases differs in that paratuberculosis appears to be continuous in its progress, while tuberculosis is saltatory. Both excite the epithelioid type of cell reaction. It is assumed that the reticulo-endothelial system is the source of these cells. In bovine tuberculosis the tubercle develops and becomes encapsulated, and unless bacilli escape from the primary focus, the disease quiets down. When escape does occur, there is a sudden revival of symptoms, with the appearance of a second crop of tubercles. The secondary tubercles remain small and necrosis is less extensive or entirely absent. Giant cells are regularly present. This change in reaction is associated with a changed attitude of the tissues associated with allergy. There is now a humoral factor, issuing from the local focus which influences the entire system and leads to a different behavior between the reticulo-endothelial system and the escaped bacilli. A partial immunity has developed. The more highly parasitic or specialized paratubercle bacillus does not stimulate any allergic condition, and the process does not ordinarily tend to become self-limited. The metabolism of the bacillus is of a character which is spent in contact with and within the epithelioid cell, and systemic effects are negligible. Even with extensive disease the temperature is about normal. In general, the focal lesions in any infectious disease represent the conditions under which the bacterium can multiply and survive and eventually leave the host. These foci have been considered the sites where the organisms are suppressed. It is a fact, however, that some organisms are unable to survive elsewhere in the host, should they break away from the primary focus, unless similar foci are established. This dual nature of the focus as a place where the parasite multiplies and where at the same time it is being opposed by the host must be kept in mind. The focus favors both host and parasite and stands for the compromise following interacting attempts at multiplication, on the one hand, and digestion on the other. The stimulating activity of the tubercle bacillus may manifest itself in many grades of intensity, leading to the development of epithelioid cells, giant cells, the stimulation of fibroblasts, and possibly the direct production of necrosis in high concentration. The epithelioid cell is not related to the macrophage either as to origin or function. It is formed locally through contact of its progenitors with the parasites or their products. It differs in these respects from the polymorphonuclear cells which are frankly phagocytic. Their activity amounts to a protection of the host generally, whereas the progenitors of the epithelioid and foreign-body giant cells tend to perform their function locally. This is in contrast with the concept of phagocytosis which postulates prompt specific aggression on the part of tissue cells. Immunity, moreover, tends towards lesser and lesser susceptibility on the part of the epithelioid cells instead of greater activity, and ending finally in the feeblest reaction, the foreign-body giant cell. The change following primary infection as manifested in secondary foci is assumed to be associated with antigenic and antibody products discharged from the primary foci which act upon the bacilli in transit and prepare the reticulo-endothelial cells for the secondary encounter. Finally it should be emphasized that differences in the histological structure of tuberculous lesions appearing more or less regularly may imply different races of bacilli as well as genetic or acquired differences in the resistance of individuals of the host species.—*Focal Cell Reactions in Tuberculosis and Allied Diseases, T. Smith, Bull. Johns Hopkins Hosp., October, 1933, liii, 197.*—*(J. S. W.)*

Formation and Treatment of Cavities.—The great majority of annular shadows represent intrapulmonary round cavities, which are characterized by their rapid appearance, their frequent disappearance, and their occasional reappearance. In cavity-formation two factors are frequently at work, destruction and inflation. In round cavities the inflation element predominates, but when these lesions first appear symptoms are usually present, and these tend to increase or decrease *pari passu* with the size of the cavity. Round cavities may persist and change into the chronic fibrotic type. The formation of destructive cavities means that a severe type of disease is present and collapse treatment should be applied if possible. Round cavities demand expectant treatment. A period of rest should be followed by further X-ray examination. A large proportion of round cavities disappear with rest, but others persist, giving rise to symptoms, and are best treated by artificial pneumothorax.—*The Formation and Treatment of Cavities in the Lung, A. Morland, Lancet, December 9, 1933, ccxxv, 1311.*—*(E. H. K.)*

Azygos Lobe.—By accessory lobe of the azygos vein is meant that anomaly in which the apex of the right lung is divided by the

vena azygos major. Normally, this vein passes up in the posterior mediastinum and then arches over the root of the right lung to enter the superior vena cava on its posterior aspect. When this abnormal condition is present, the vein pursues a more lateral course, cuts into the apex of the right lung and then passes forward and medially to enter the superior vena cava on its lateral aspect. Since the vein normally lies outside both layers of the pleura, it carries with it, when it is displaced downward into its abnormal position, both the visceral and parietal layers. The term "meso-azygos" is applied to the septum thus formed in the lung. The vein lies at the base of this invagination. The actual position of the meso-azygos may vary considerably, but may be summarized as more or less horizontal, more vertical and tending to bisect the apex, and vertical. Because the lobe is supplied by an eparterial bronchus and not by a separate branch from the right bronchus, the possibility of its being supernumerary is eliminated. Radiographically the condition is characterized by a thin line which starts at the upper border of the right lung, curves outward, downward, and then inward and terminates in the form of a dense shadow about the level of the second costal cartilage. The thin curved line is the mesoazygos in optical section, while the dense shadow is cast by the vein. The condition develops in foetal life, but the actual cause is obscure. A familial tendency is suggested. In a series of 280 consecutive radiograms of the chest made during a period of one year, the frequency was 0.71 per cent. In a series of 5,000 films, the frequency was 0.20 per cent. An aberrant azygos vein may narrow the bronchus leading to the accessory lobe and produce a well-marked bronchiectasis beyond the point of obstruction. In the presence of pulmonary tuberculosis, the azygos lobe and mesoazygos are not infrequently involved. A splitting of the layers of the mesoazygos may occur in an otherwise "normal" chest, following the induction of artificial pneumothorax, or the development of an interlobar effusion. An azygos lobe which is not the seat of any definite pathological process can produce signs that are strongly suggestive of the presence of tuberculous infiltration. The literature is reviewed and 14 cases reported.—*The Accessory Lobe of the Azygos Vein: a Record of Fourteen Cases, with Special Reference to Heredity as an Aetiological Factor, and to Pathological Features of the Condition, E. A. Underwood and N. Tattersall, Tubercle, October, 1933, xv, 1.*—(*T. O. R.*)

Blood Studies in Tuberculosis.—This investigation was based on blood examinations made on 1,700 tuberculous patients. The average percentage of neutrophiles increased in the more advanced stages of the disease. Furthermore, a high percentage of neutrophiles indicated a less favorable outcome. However, this latter finding was of prognostic value only in stages II and III. An analysis of the Schilling counts, in which changes were expressed mainly in the *stabkernige* cells, revealed similar findings. The average blood-sedimentation rates also increased with the more advanced stages of the disease but the prognostic value of this examination was less significant. A comparison of these three blood examinations showed that they were not necessarily parallel in any one case but that there was greater agreement when they indicated improvement rather than progression of the disease. In order to obviate this discrepancy as much as possible, an index figure was formulated. This figure expressed the ratio between the neutrophiles and the lymphocytes, the ratio between the large mononuclear cells and the lymphocytes, the percentage of *stabkernige* cells in the percentage of neutrophiles, and the sedimentation-per-hour-rate percentage. This index figure, when correlated with the clinical condition of the patient, was found to give more accurate information than any one of the individual blood examinations. Its main advantage lies in the ease with which comparisons of one group of blood examinations can be made with a subsequent group, in spite of the apparent contradictory variations within one group.—*A Study of the Differential Count and the Sedimentation Test in Tuberculosis with a Suggestion for an Index Figure Summing up the Information Derived from Them, C. Fremont-Möller and R. M. Barton, Tubercle, September, 1933, xiv, 529.*—(*T. O. R.*)

Cancer Cells in Serous Effusions.—As determined by a study of 50 cases, neoplastic cells are readily demonstrable in pleural and peritoneal transudates resulting from neoplastic disease of the serosae. They may be seen clearly in preparations secured by centrifugation of freshly aspirated fluid, followed by Zenker fixation, paraffin embedding and staining of the centrifugate. The tumor cells are believed to proliferate more or less actively within the fluid in which they are suspended. They occur as single cells or as clumps showing a more or less marked tendency toward organoid arrangement. True tumor giant cells occur not infrequently and may be present in large numbers. Multipolar mitosis is followed in some cases by cellular disintegration. No figures definitely identifiable as phases of nuclear reconstruction after multipolar mitosis were seen.—*The Cancer Cells of Serous Effusions,*

G. S. Graham, Am. J. Path., Supplement, 1933, ix, 701.—(J. S. W.)

Cultivation of Monocytes in Fluid Medium.—The plasma coagulum that is customarily used in the Carrel technique for the cultivation of monocytes seriously interferes with quantitative measurements of their metabolism. For such studies it would be a great advantage to replace it with a liquid. An effort was made to find a means whereby monocytes could be cultivated for a long time in a small volume of fluid without using other cells as food. By a special technique the cells were made to grow on a fluid medium, the original tissue and the coagulum having been removed. Monocytes from the blood and spleen of chickens were thus cultivated in Carrel flasks for over two months. Serum, diluted with Tyrode solution, supplied all the essential nutritive substances. Cultivation in fluid was made possible by adjusting the initial pH of the fluid to 7.4 and not allowing it to fall below 7.0 or 6.8. The cells remained in good condition when the pH was adjusted with either lactic or hydrochloric acids or carbon dioxide. Adjustment with carbon dioxide was found to be more convenient and also more practical, since it does not destroy the buffer action of the medium. After two months of cultivation, the monocytes were in excellent condition and still proliferated actively. They gave every indication that indefinite multiplication could be maintained under the conditions of these experiments.—*The Cultivation of Monocytes in Fluid Medium, L. E. Baker, J. Exper. Med., November 1, 1933, lviii, 575.—(J. S. W.)*

Serum Tryptophane in Tuberculosis.—In a number of normal individuals the average tryptophane content of the serum was found to be 1.38 mgm. per 100 cc. of blood in males and 1.60 in females. A total of 661 determinations were made on 167 patients with pulmonary tuberculosis. It was found that tryptophane content increased with the severity of the disease. The average content in severe cases was 2.35 mgm. per 100 cc. There exists a fair parallelism between the tryptophane content and the sedimentation rate.—*Über den Tryptophangehalt im Blutserum bei Lungentuberkulose, E. Adler, Beitr. z. Klin. d. Tuberk., February, 1934, lxxxiv, 291.—(M. P.)*

Functional Respiratory Hypocapacity.—A functional "hypocapacity" of the lungs exists in the absence, by definition, of demonstrable organic lesions of either the pulmonary parenchyma or of the pleura. Functional hypoventilation of the apices represents the first stage in this condition. The syndrome may be recognized by definite signs demonstrable on auscultation and percussion, and by characteristic roentgenographical findings. The mechanism involved is basically similar to the underlying analogous conditions of malfunction in other systems of the body. Pulmonary "hypocapacity" may be found without stigmata of other functional imbalance, or it may constitute a part of a "multisystemic" dysplasia.—*Conceptions cliniques de l'hypocapacité respiratoire fonctionnelle, G. Breccia, Arch. méd. chir. de l'app. respir., 1934, viii, 209.—(V. T.)*

Basic Blood-Pressure.—The basic blood-pressure is that arterial pressure against which the systolic force of the heart has to drive the blood. The prognosis is poor when the systolic pressure decreases, the diastolic pressure increases, or the normal systolic-diastolic ratio of 3 to 2 is reduced.—*The Basic Blood-Pressure in Pulmonary Tuberculosis, G. A. Stephens, Tubercle, November, 1933, xv, 68.—(T. O. R.)*

Reaction of Pleura.—From experimental studies of the reaction of the pleura to injection of bovine bacilli into the pleural cavity of rabbits, it appears that the initial response is cellular, with polymorphonuclear leucocytes predominating. Within twenty-four hours the fluid originally injected has, for the most part, disappeared, and mononuclear cells outnumber the polymorphonuclear cells. At first these cells are of the large mononuclear or clasmatocyte type, but in the chronic effusions lymphocytes are most numerous. About the ninth day a reaccumulation of fluid occurs which often increases until the animal dies; and this development of fluid is considered the response of the body to the specific infection. The cellular reaction encountered in the first hours after injection is a simple nonspecific reaction. In these experiments, the injection was made only into the right pleural cavity but a left-sided effusion usually occurred, due either to filtration through the mediastinum or to sympathetic irritation. In only one animal were bacilli found in the left-sided effusion. Within six hours after injection of the bacilli practically all of the organisms were phagocytosed by polymorphonuclears; by the end of the first day this activity was being taken over by mononuclear cells, especially the clasmatocytes, and at this time polymorphonuclear cells were rapidly disappearing from the fluid. By the sixth hour after injection a rapid decrease in the number of bacilli in the pleural fluid became evident, and virulent organisms could be

demonstrated in every tissue of the body, this rapid dissemination apparently having occurred by way of the lymphatics.—*The Cellular Reaction of the Pleura to Infection with Mycobacterium Tuberculosis, L. G. Montgomery & W. S. Lemon, J. Thorac. Surg., June, 1933, ii, 429.*—(*B. B.*)

Motor Phenomenon of Mediastinum.—The physiological changes in the movement of the mediastinum may be recorded with a Jarre cinex-camera. The examinations, made with the patient in the anteroposterior, posteroanterior, and lateral positions, included a study of the naso- and oropharynx as well as the chest. The positions of the viscera were disturbed by the cardiac and respiratory cycle, emotional states of the patient, and movement of the liver. The most striking observation was the mediastinal shift occurring without any particular rhythm. Engorgement of the large vessels was responsible for some of the cardiac mediastinal prominence. The trachea shifted with the mediastinum. A physiological narrowing of the trachea was noted at the height of inspiration. During expiration the contractile powers of the trachea and larynx apparently are not sufficient to straighten the trachea, and a physiological buckling of this structure occurs. Varying degrees of thymic hypertrophy are indicated by a constant lobation as demonstrated in the prone position, constant displacement of the trachea, and intermittent pressure on the trachea, particularly if noted at the height of inspiration. X-ray examination of the chest is recommended to differentiate other intrathoracic abnormalities.—*A Study of the Motor Phenomenon of the Mediastinum in Infants and Children: with Particular Reference to Hyperplasia of the Thymus, C. K. Hasley, Radiology, November, 1933, xxi, 477.*—(*T. O. R.*)

Laparotomy and Lung-Volume.—Pulmonary complications following laparotomy have been explained as being due to the rise of the diaphragm which supposedly occurs as a result of the change from a negative to an atmospheric intraperitoneal pressure as soon as the abdomen is opened. By use of lung-volume measurements in dogs (as described in the article immediately preceding this one, in which the method of Christie for determining human lung-volumes by means of an altered metabolism spirometer has been applied to dogs, *Cf. reference below*) it is shown that this hypothesis is probably wrong, since no decrease in lung-volume occurs after simple laparotomy. After induction of pneumoperitoneum with positive pressures, however, a demonstrable reduction of lung-volume occurs, as is also the case when the intestines are distended or when the stomach, isolated by ligatures above and below, is distended. These experiments show that acute abdominal distension causes decrease of lung-volume, and suggest the importance of the relationships between postoperative abdominal distention and the development of pulmonary complications in humans.—*Effect of Laparotomy and Abdominal Distention on Lung Volume, H. K. Beecher, H. H. Bradshaw and G. Lindskog, J. Thorac. Surg., June, 1933, ii, 444.*—(*B. B.*)

Influence of Digitalis on Respiration.—Therapeutic doses of digitalis or strophanthin exert no influence on the respiratory function nor on the basal metabolic rate in normal individuals. The ventilation which is reduced by narcotics remains uninfluenced by strophanthin. Digitalis in therapeutic doses produces in normal individuals a marked fatigue and a decrease in mental efficiency. In healthy individuals the oxygen consumption and the carbon-dioxide excretion remain unaltered after the administration of strophanthin or digitalis. Objective fatigue as determined with the ergometer, and the period of recuperation remain the same.—*Die Wirkung der Digitaliskörper auf die Atmung, A. Anthony, A. Bierling and L. Clemens, Beitr. z. Klin. d. Tuberk., August 23, 1933, lxxxiii, 241.*—(*M. P.*)

Cardiac Output.—By means of a specially devised double-barrelled cannula inserted into the trachea, studies can be made in dogs on the right and left lung separately by attaching each tube with its own respiratory system of valves, soda lime, and spirometer. With such apparatus, plus oxygen determinations on venous and arterial blood, it is possible to determine the cardiac output per minute according to the principle of Fick; and, by measuring the oxygen absorption of each lung separately, the fractions of blood passing through each lung can be calculated after such procedures as artificial pneumothorax and occlusion of a bronchus. It is generally recognized that the nature of the dog's mediastinum renders this animal unsuitable for most pneumothorax investigations; however, for these experiments this animal is suitable, and it was found that the induction of pneumothorax produced a decrease in the tidal air of each lung, irrespective of the side into which air was introduced, the percentage decrease always being greater on the left side. In each experiment, too, a reduction of cardiac output occurred, although not proportional to the decrease of tidal air. By partial occlusion of a bronchus, produced by tightening a screw-clamp

around tubing connecting to the cannula, the tidal area of the occluded lung was reduced, the tidal area of the other lung was increased, that of the two lungs combined was decreased, and the cardiac output was decreased. In one experiment the total tidal-air volume was increased, as was also the cardiac output. Following unilateral phrenicectomy in one case the tidal air increased distinctly, but in other cases was essentially unchanged as a result of the operation. In bilateral phrenicectomy the results were variable. The inconsistency of the effects of phrenicectomy on tidal-air volume changes is possibly accounted for on the basis of operative shock to the nervous system. Cardiac output following phrenicectomy decreased. By allowing one lung to respire pure nitrogen the oxygen-absorbing power of this lung was completely shut off without impairing the mechanics of its respiration; and it was thus found that no changes in tidal-air volume occurred, nor, by indirect calculation, that blood was shunted from one lung to another. In these nitrogen experiments cardiac output was found to decrease in three out of five cases. An important observation made from these experiments is that various alterations in the mechanics of respiration may be accompanied by decrease of minute volume output of the heart and that, even though details of this relationship are not understood, it is probable that this decreased cardiac output may account for the "circulatory failure" seen after some chest operations. It is concluded, also, that the tidal air of one lung may be markedly decreased without shunting of blood to the other lung.—*The Effects of Closed Pneumothorax, Partial Occlusion of One Primary Bronchus, Phrenicectomy, and the Respiration of Nitrogen by One Lung on Pulmonary Expansion and the Minute Volume of Blood Flowing through the Lungs, R. L. Moore & H. W. Cochran, J. Thorac. Surg., June, 1933, ii, 468.*—(*B. B.*)

Nature and Rôle of Bacterial Allergy.—The present article is an address delivered at the Third International Pediatric Congress, London, July, 1933. It is in the nature of a critical review in which are briefly discussed the author's conception of the functions of allergy and anaphylaxis, particularly the allergy of tuberculosis. The term allergy is used as synonymous with an acquired hypersensitiveness which develops as the result of the entry of a foreign protein into the tissues and which manifests itself locally by the occurrence of tissue damage and inflammation whenever the foreign protein or a specific fraction of the sensitizing molecule lodges in the previously sensitized tissues. Anaphylaxis is another type of hypersensitiveness, the musculospasmodic type. Both states of reactivity are probably fundamentally the same, but, since their effects are quite different, and either condition can be established without the development of the other, it is convenient in the present state of our information to designate them by different terms. In bacterial allergy, just as is the case in anaphylaxis, the effective antibody is that which is bound fast to the tissue cells, but, in contrast to anaphylaxis, no appreciable excess of antibody circulates in the blood-stream. In tuberculosis it has long been taught that hypersensitiveness is necessary for the successful operation of immunity, that the allergic inflammation is necessary for the protection of the body as a whole, for it is assumed that it is the mechanical effect of the inflammatory exudate which is responsible for the localization of infection in the immune body. In addition, the exaggerated inflammation is also assumed to be necessary for the more efficient destruction of bacteria which is characteristic of the immune state. Of late serious doubts have been cast on this widely accepted view, particularly as the result of some experimental work in the author's laboratory. In this investigation it was found that in guinea pigs, which were kept continually completely desensitized by the daily injection of tuberculin throughout the period following virulent infection, both the inhibition of spread of bacilli and the inhibition of their growth in the body were just as effective as in the animals which were allergic at the time of infection and thereafter. In fact, the Koch phenomenon was found to be almost absent in the nonallergic immune animals. Apparently allergic inflammation is not at all necessary for the more efficient destruction of bacteria by the immune body. Experiments with other organisms, namely spirochaetes (syphilis) and pneumococci, bear out this view. The tissues of the body with a high degree of natural immunity to a particular bacterium are relatively indifferent to the presence of that bacterium as it dies out. There is no appreciable death of tissue and inflammation is very slight in amount. This is obviously far superior to any state of reactivity in which an exaggerated destruction of tissue occurs while the bacteria are being destroyed, such as happens in the allergic body. The inhibition of spread of bacteria from the site at which they lodge is widely believed to be simply a mechanical result of the prompt allergic inflammation which is thrown about the bacteria, but careful studies with pneumococci show, however, that the immobilization of the bacteria in the immune, nonallergic body is just as

effective as it is in the allergic one. The spread of bacteria in the immune body is prevented primarily not by allergic inflammation, but rather by the action of antibody upon the bacteria (pneumococci), altering them in such a way that they adhere not only to themselves, but also to the tissues of the immune body. Since it is clear that allergy is not an essential part of immunity, and the two phenomena can be separated from each other it is a matter of interest to know what would be the effect of the presence of allergy in the absence of immunity. This reverse side of the picture has recently been apparently achieved. Independent investigators have succeeded in establishing a high degree of allergy to tuberculin by treating animals with large doses of purified tuberculoprotein. When these allergic animals were tested for immunity by the injection of virulent bacilli, it was found that no immunity to tuberculosis was present and, in fact, the time of survival was less than in the normal controls. Allergy and immunity may and frequently do coexist; but that they always coexist or that they always parallel each other in degree is certainly not the case. It is obvious, therefore, that the tuberculin test and other similar allergic reactions should not be used as an index or measure of immunity. The presence of bacterial hypersensitiveness is only an evidence of infection. In the study of tuberculosis, cases are repeatedly encountered in which there is a low degree of resistance present with a high degree of hypersensitivity and *vice versa*. The Negro provides a striking example of the former condition. Allergy is not at all necessary for the operation of immunity and in some cases may do great damage to tissues and even endanger life itself. When we possess an adequate method we may be able to protect such cases by desensitization without sacrificing the ability of the body to resist infection by means of the acquired forces of immunity. And desensitization must be maintained continuously for a period of time long enough to permit the forces of immunity to act without being thwarted by the recurrence of tissue hypersusceptibility. The presence of allergy converts a bacterium which does not produce a toxin into one which does, that is, it converts the harmless protein product of bacterial disintegration into a violent and even lethal poison. There is not one single experiment or observation on record through which hypersensitiveness has been shown to be necessary for the operation of immunity in any infection under any condition whatsoever. The studies presented in this paper serve to encourage the investigation of the results of freeing the infected body from the damaging effects of hypersensitiveness with the knowledge that the abolition of allergy will not entail a loss of the protective power of acquired immunity.—*Experimental Pathological Studies on the Nature and Rôle of Bacterial Allergy, A. R. Rich, Lancet, September 2, 1933, ccxxc, 521.*—*(J. S. W.)*

Immunity after Abolition of Allergy to Nontuberculous Infections.—It has long been assumed that it is the accelerated and exaggerated inflammation of allergy which, in the immune body, is primarily responsible both for the prevention of spread of the bacteria and for their more efficient destruction. This belief arose largely out of the close association of allergy and immunity in tuberculosis in the guinea pig. From a study of this association came the familiar conclusion that allergy and immunity always parallel each other in intensity and that "immunity is achieved through allergy." There are many good reasons, however, for believing that allergy and immunity in tuberculosis do not always parallel each other, either in the guinea pig or in the human being, and since it is generally recognized that allergic hypersensitivity is all too commonly responsible for damage and death of tissue, it was thought to be a matter of first importance to attempt to determine definitely whether or not acquired immunity to bacterial infection can operate effectively in the absence of the exaggerated tissue damage and inflammation which is attendant on the allergic state. The present experiments were undertaken to determine directly whether or not the hypersensitiveness of the immune, allergic body could be suddenly abolished without entailing a corresponding loss of the body's resistance to infection. In order to ensure the persistence of the state of desensitization during the entire period of the experiment, infections were chosen which run their course to a fatal termination in nonimmune controls within a period of hours. In the first experiment *Pasteurella aviseptica* was used for the reason that this bacterium is extremely virulent for the rabbit and immunity can be established by vaccination with killed organisms. A series of rabbits was vaccinated with killed *P. aviseptica* and an attempt was made to abolish the hypersensitiveness (allergy) which had developed by desensitization and to study the effect of such treatment upon immunity to infection. For this purpose large intravenous injections of vaccine were given to a group of the vaccinated rabbits. Some animals died as a result of this treatment, but the majority quickly recovered. Several hours after a second intravenous injection the treated animals, the untreated

immunes and normal controls were given two or more intracutaneous injections of a diluted 20-hour-culture of virulent pasteurella. The sites of infection were carefully watched, following the test infection. One of the sites was removed for microscopical study when desired. At twenty-four hours all the controls were either dead or dying. Eighty-six per cent of the desensitized immunes and 80 per cent of the undesensitized immunes survived. Another group of rabbits was vaccinated with *Pneumococcus I*, as this strain produces a high degree of allergy. It is also highly virulent, but the multiplication of this microörganism in the body is not nearly as rapid as that of *P. aviseptica*. There is a more striking contrast between the allergic reactions and the control lesions than in the previous experiment. The method of procedure was essentially the same as that used in the *P. aviseptica* experiment. The test dose was a 15-hour-culture of pneumococcus diluted 5 times. The effect of the desensitizing injections on the character of the response to infection was most striking. As late as seven hours after injection most of the desensitized animals showed no macroscopical lesions, although an occasional one had a slight reaction at the time. At every observation the amount of inflammation in the desensitized group was always seen to be less than it was in the controls. The accelerated or exaggerated inflammation of allergy was lacking, yet immunity was unimpaired. All of the desensitized and nondesensitized immunes survived, whereas every control rabbit died. When the capacity for reacting with allergic inflammation is completely destroyed by the injection of large doses of killed bacteria into the veins of hypersensitive, immune animals, immunity to intracutaneous infection with millions of lethal doses of living, virulent bacteria remains intact. Although the inflammation at the site of injection is far less than even in the normal controls, the bacteria are prevented from spreading from the site, and are effectively destroyed as they are in the allergic, immune body. The immune state so greatly enhances the protective power of the inflammatory mechanism that much less, rather than much more, inflammation is required to protect the body from infection. Damage to tissue at the site of infection is also far less in the desensitized animals than in the allergic ones. Even in the highly allergic immune body, therefore, allergic inflammation is not necessary for protection against infection, and in its absence the body is protected with much less damage in tissue than that which occurs in the allergic body. —*The Persistence of Immunity after the Abolition of Allergy by Desensitization, A. R. Rich, F. B. Jennings, Jr., and L. M. Downing, Bull. Johns Hopkins Hosp., October, 1933, liii, 172.*—(*J. S. W.*)

Infection and Reinfection in Monkeys.—Experiments on infection and reinfection of monkeys (*Macacus* and *Semnopithecus*) yielded the following results: Following subcutaneous infection with human tubercle bacilli of slight virulence, a typical tuberculous primary complex, as defined by Ranke, is formed. If the number of bacilli injected is very small, the regional lymph node does not become diseased and the internal organs remain normal. The local reaction starts with the proliferation of epithelioid cells, followed by immigration of polynuclears and by tissue necrosis. The necrotic focus is usually transformed into an abscess. When the abscess is evacuated through the skin, the remaining focus consists of granulation tissue. Similar primary complexes develop after intravenous and inhalation infection. Following subcutaneous reinfection the local lesion has not the characteristics of a primary complex. Regardless of the mode of reinfection the tubercle bacilli lodge exclusively in the lung and do not infect the internal organs nor the lymph nodes. There is a marked increase in resistance in previously infected animals, regardless of whether a primary complex was formed or not. The foci of reinfection showed necrosis only in rare cases. The difference between primary and reinfection is particularly clear-cut in inhalation infections; here, the primary infection causes an exudative-caseating pneumonia, while reinfection does not cause caseation. In contradistinction to guinea pigs and rabbits, monkeys do not show haematogenous spread following subcutaneous infection. Following intravenous infection multiple, but characteristic primary complexes develop in the lung, spleen and liver. Pulmonary cavities develop only after inhalation infection. While Langhans giant cells are very rare in primary infections, they are very numerous in reinfection. Whenever infection takes, the intracutaneous tuberculin reaction becomes positive and remains so, even after healing.—*Experimentelle Untersuchungen über den Infektionsmodus und die pathologische Anatomie der Tuberkulose beim Affen, Y. Nakada, Beitr. z. Klin. d. Tuberk., September, 1933, lxxxiii, 377.*—(*M. P.*)

Infection, Reinfection and Superinfection in Pulmonary Tuberculosis.—Tuberculous infection of the lung through the intestinal tract is possible but very infrequent. The entrance of tubercle bacilli into the lung through the lymphatics from the oral and rhinopharyngeal cavities is very

rare and a direct lymphatic route in this region has not been demonstrated. In eighty per cent of the cases infection occurs by inhalation with the human type of tubercle bacillus and its first manifestation is the primary complex. In the development of post primary tuberculosis or that which follows the primary lesion (seen in reinfections and superinfections) immunological and allergic changes play a very important part. —*I moderni concetti della infezione, reinfezione e superinfezione della tubercolosi polmonare, G. Bianchi, Tubercolosi, June, 1933, xxv, 173.*—(*U. E. Z.*)

Vaccination of Rabbits with Defatted Tubercle Bacilli.—Rabbits were treated with tubercle bacilli, defatted by prolonged extraction with ether and alcohol. The vaccination was given subcutaneously in one group and intravenously in another group. During the period of vaccination, all animals developed anaemia and leucopoenia. After cessation of treatment a gradual increase of blood cells beyond normal occurred. On the part of the white cells this compensation was accounted for principally by well-marked lymphocytosis. The vaccinated animals and controls were inoculated intravenously with 0.1 mgm. of bovine tubercle bacilli. The average survival time of the control animals was 167 days while the subcutaneously vaccinated animals survived, in average, 249 days, and the intravenously vaccinated animals 319 days. The vaccinated animals had fewer and less extensive lesions than the controls, and vaccinated animals dying more than one hundred days after inoculation showed no involvement in the bone-marrow and in the lymphoid tissue, while the controls showed such lesions commonly. The injection of partially defatted tubercle bacilli produced skin allergy in normal guinea pigs. —*The Resistance of Rabbits to Tuberculosis after Vaccination with Partially Defatted Tubercle Bacilli, K. C. Smithburn, J. Exper. Med., September 1, 1933, lviii, 329.*—(*J. S. W.*)

Susceptibility of White Mice to Tuberculosis.—Fully grown white mice were injected intraperitoneally and intravenously with recently isolated human and bovine strains and with a virulent avian strain. Two or three weeks' old cultures were used and doses varying from 0.025–1.0 mgm. moist weight of bacilli were given. In the animals infected with human or bovine strains the tendency for macroscopical lesions to appear in the lungs is striking. Those mice showing advanced pulmonary tuberculosis usually exhibited multiple tuberculous lesions in the liver. Only a few had macroscopical tubercles in the spleen, although many showed splenic enlargement. Involvement of the liver and spleen was more frequent with the use of bovine than with human strains. The intravenous inoculations were more effective than those given intraperitoneally for a given dose. The average period of survival in mice given 1 mgm. of bovine bacilli was almost the same as in those receiving the same dose of human bacilli, and the gross and microscopical appearances of the lesions were indistinguishable. Caseating tubercles were unusual in the liver and spleen, but caseous nodules in the peritoneum were common in the mice inoculated intraperitoneally. Mice did not die from infection due to avian bacilli, and small doses resulted in no gross lesions, although epithelioid tubercles and lymphocytic infiltration in the liver and spleen were visible microscopically. Larger doses caused characteristic lesions in the liver and spleen, but no gross lesions in the lungs, and never caseation.—*Susceptibility of the White Mouse to Tuberculosis, F. D. Gunn, W. J. Nungester and E. T. Hougen, Proc. Soc. Exper. Biol. & Med., February, 1934, xxxi, 527.*—(*F. B. S.*)

Experimental Pneumothorax.—Determinations of oxygen absorption and percentage saturation of arterial blood in the rabbit before and after open pneumothorax showed that in open pneumothorax less blood flows through the collapsed than through the functioning lung. Anoxaemia is not due to free circulation in the pneumothorax lung, but to defective oxygenation in the functioning one. The ratio between the right and left lung's oxygen absorption is normally about 3:2, and in 14 experiments the right lung's share in oxygen absorption was found to average 58.2 per cent. In 7 out of 11 experiments this ratio was suddenly changed following injection into the heart or femoral artery, during 5–15 minutes, of 30–35 cc. hirudin solution, which was a suspension of ground leeches' heads. The ratio was unchanged during small pneumothoraces (20–30 cc.). With larger pneumothoraces the pneumothorax-lung's share in oxygen absorption and circulation decreased with the fall in its ventilation; at the same time oxygen absorption and circulation of the contralateral lung increased to such an extent that total oxygen absorption and minute-volume were but little affected. With a pleural pressure above zero the pneumothorax-lung's ventilation and oxygen absorption were arrested and the minute-volume diminished. The available experiments concerned with the circulation in lung areas, where the ventilation is reduced by pneumothorax or by obstruction of a bronchus, show an imme-

diate and permanent decrease in the circulation through them.—*Experimental Pneumothorax, K. Tørning, Acta tuberc. Scandinav., 1934, viii, 1.*—(*F. B. S.*)

Growth of Acid-Fast Bacteria.—Single tubercle bacilli, isolated with the micromanipulator, grow well on solid or liquid media, but growth is much inhibited in most cases in microdroplets in the moist chamber. Both tubercle bacilli and other acid-fast organisms were observed in microcultures. They multiply by simple cross-fission, which may or may not be preceded by endobacillary granulation. A developmental cycle, as described by Kahn, was not observed. Some of Kahn's developmental phases are interpreted as degenerative forms due to the unfavorable growth conditions in microdroplets. Observations of microcultures must be interpreted with great caution, because of the unfavorable conditions and because foreign particles may be mistaken for bacillary forms.—*Untersuchungen über das Wachstum Säurefester in Mikrokulturen, A. Mayer, Beitr. z. klin. d. Tuberk., February, 1934, lxxxiv, 335.*—(*M. P.*)

Life-Cycle of Tubercle Bacillus.—In a previous study of more than 200 strains which were obtained in some relation to tuberculosis many variable features were observed which established most of these strains as unstable and pleomorphic. Most of these strains failed to show any relationship to the tubercle bacillus or to the disease, although it was equally true that no proof was obtained that they were not related, except in their inability to become tuberculogenic. Although many seemed to be in intimate contact with the tuberculous process and were pathogenic, neither culture nor animal inoculation, including serial passage, could establish them as tuberculogenic unless they originated directly from a tubercle bacillus or a granule of a tubercle bacillus. These apparently barren experiments were interspersed among the successful experiments, affording valuable controls against spontaneous tuberculosis and against the finding of acid-fast bacilli in normal lymphatic structures. In this series and in a larger series recently studied no acid-fast bacilli were found in lymph nodes of guinea pigs which were not in contact with some form of tubercle parasite. Spontaneous tuberculosis will result in any laboratory if the guinea pigs are not properly dieted and are not kept away from contact with other tuberculous animals. In view of this possibility, it cannot be denied, therefore, that any proof dependent upon animal passage alone is subject to serious criticism. The variability of the tubercle bacillus can best be illustrated by two aspects of the problem: first, observations of a life-cycle different from the usual fission reproduction, and second, a summary of some new work on filtration. Smears from the lung tissue taken from a localized caseous pneumonia revealed literally thousands per field of acid-fast bacilli, bearing at the ends or, most commonly, in the middle large purplish oblong granules measuring about 0.7 by 1.2 microns. In dark fields, the granules within the bacilli appearing with a reddish refraction could be seen to divide first horizontally, then parallel to the bacillus, producing tetrads. Simultaneously they lost their red refraction and took on gradually a blue tint. No sprouting was observed as with a previously studied culture, but stained smears revealed that many such changes as sprouting and the formation of comma-shaped, horseshoe-shaped and pessary forms had taken place in the course of reproduction. Single-cell pickings, however, were more convincing. Refractile granules were picked and inoculated subcutaneously into guinea pigs. One granular bacillus with one large granule and three small granules produced a slight and atypical tuberculous infection. Six and ten granules, respectively, produced a more typical tuberculosis, which on arbitrary dosage of about fifty in a larger series produced typical tuberculosis; smaller doses were all negative. This is, therefore, the first absolute proof that "Much's granules" will produce tuberculosis, although the granules observed by Much, no doubt, consist of a variety of forms differing in different circumstances. Attempts were made to obtain pure cultures from single cells. One mold-like growth was obtained from the first subculture on Petroff's medium that produced a dry mucoid colony of a semi-acid-fast mycelial growth that killed guinea pigs with an atypical tuberculosis. Typical acid-fast bacilli were found in guinea pigs. After many attempts a colony was isolated from a single granule. This is a typical human-type bacillus that has remained pure and unchanged for six years. Another microorganism from autopsy was even more interesting in that many semi-acid-fast forms could be caused to revert to acid-fastness and correspondingly develop tuberculogenic qualities. The filtration experiments were repeated because of the numerous negative and indefinite reports recently in the literature and, particularly, because of the objections raised concerning contamination. In the new experiments the material consisted of twelve specimens, including pus from cold abscesses, pus from nontuberculous abscesses, macerated cultures of tubercle bacilli, macerated livers of foetuses from

tuberculous mothers, and macerated animal organs. The results seem to show that where no tubercle bacilli are present (as shown by controls) the animals all survive; where there is an avirulent tubercle bacillus, the animals also survive; where the culture is virulent there is an "asthenic" death in about two months, without tubercle, without acid-fast bacilli, and without the power to infest subsequent animals. With certain cold abscesses and other forms of septic material, there is likewise a "filtrate disease," but it is transmissible in series to other guinea pigs; in other cases there is a direct return to acid-fast bacilli and usually atypical tubercle-formation, or there is an apparent return on one or two passages in animals. The work on three foetuses was negative for filter-passing forms, although one was positive in a control animal. The theory of a "filtrate toxin" or a "bacillo-casein" cannot explain the phenomenon of transmissibility of the virus or the slow return to acid-fastness and tuberculogenic qualities. As a theoretical explanation it may be thought of as a toxic death from very small gonidia or fragments of virulent tubercle bacilli that may go through an existence of their own, occasionally returning to acid-fastness, but otherwise going on indefinitely until they run their course. The question of filterability of the tubercle bacillus is, therefore, not only open, but seems to demand further experimental work.—*VI. Notes on Live Cycle Phenomena and Filtrability of the Tubercle Bacillus, H. C. Sweany, J. Bact., June, 1933, xxv, 587.*—(*F. G. P.*)

Foodstuffs and Metabolism and Growth of Human Tubercle Bacilli.—In any tuberculous lesion the bacilli must obtain energy for life and growth. The processes involved and their significance for the progress or arrest of a lesion can be investigated by studying, first, the metabolic characteristics of the bacteria, and, second, the environment to which they are exposed. Particular attention may be directed to the blood supply, the monocytes and the caseous material because they may be essential determinants of the quantity of energy available to the bacteria. The strain of human tubercle bacillus known as H37 was used in these experiments. The cultures were all transplants of the stock material that had been grown from a single organism isolated by Kahn (1929). The cultures were maintained in successive transplants on a fluid medium of Long. Early in these studies it was found that removal of tubercle bacilli from Long's to a non-nutrient solution did not result in a prompt depression of the respiration. Deprival of foodstuffs for several days was necessary. For this purpose the surface growth of bacilli was floated upon 50 cc. of a sterile solution containing 0.9 per cent sodium chloride and M/150 sodium-phosphate buffers at a pH of 7.4. After several days on this fluid the bacteria were transferred to the respiratory vessels for metabolic study. Depending upon the purpose of the experiments these contained one of the following solutions: 1. Long's medium, unchanged or with the omission of one or more ingredients. 2. A 0.9 per cent solution of sodium chloride buffered with sodium phosphate as just described. 3. Distilled water similarly buffered. The last two were employed with or without the addition of the foodstuffs to be tested. A modified Barcroft—Warburg manometer was used for measuring oxygen consumption. In experiments with the various foodstuffs there was included a determination of the oxygen consumption of the starved bacteria in a saline phosphate solution. With sodium lactate the respiratory studies were supplemented by the chemical determination of the lactate disappearing from the solution. The carbohydrate and allied compounds used in these experiments were glucose, racemic sodium lactate, mannose, levulose, glycogen, inositol, arabinose and glycerol. The fatty acids were oleic, stearic and palmitic. In order to test the influence of an animal fat, cream of 40 per cent fat content was employed. This was washed repeatedly. The serum and serum-fat used for these experiments were obtained from normal or arthritic patients. In two experiments the lactic acid and glucose content of the serum was determined, and in two others these interfering substances were removed by dialysis. Lecithin from eggs was made into a 0.5 per cent solution in a solution of saline and phosphate. Caseous material was obtained from a tuberculous kidney at operation. The method employed in these experiments gave the average respiration per milligram of the whole mass of bacteria under investigation. The period during which respiration was measured was only a few hours. This made possible a great gain in simplicity of manipulations, for it became unnecessary to maintain strictly aseptic conditions in the Warburg vessels. Another possible source of error was the autoxidation of foodstuffs. The various soaps, serum-fat, and lecithin were investigated and found to have no oxygen uptake. The effect of shaking the Warburg vessels was determined. It was found that absence of shaking was associated with a diminution of oxygen uptake which varied from 25 to 35 per cent. The results of this study show that the tubercle bacilli of the H37 strain consume oxygen at a rate which is compara-

ble to that of mammalian cells. One of the foodstuffs which causes the highest oxygen consumption is glycerol. However, for purposes of oxidation this can be replaced by a number of substances. Some are about as effective as glycerol. These are sodium lactate, the sodium salts of the higher fatty acids, and diluted blood serum or caseous material. Lecithin, milk and serum-fat fall in the same category. Smaller effects are observed with glucose and glycogen. For respiration, it is not necessary that the substances mentioned should be present in the concentrations required for abundant growth. Stimulation of respiration by glycerol is perceptible at 0.005 per cent and by sodium lactate in nearly as weak solution. The effect of soap is very marked at 0.1 per cent. Milk-fat at this dilution seems to produce detectable stimulation. Both glucose and lactate are effective in concentrations at which they occur normally in the blood. These observations explain how it may be possible for the tubercle bacillus to obtain energy from the circulating blood in the body at concentrations of various foodstuffs which in culture media may be unable to support rich growth. The rôle of white blood cells in supplying bacteria with foodstuffs has only been suggested. Glycogen and lactate might be more readily furnished by monocytes, for instance, than by the circulating blood. The caseous material contains several ingredients each of which is capable of supporting a high level of respiration by H37. In fact, upon this material there was evidence of adequate food supply and no toxic effect upon the respiration for several hours.—*The Influence of Foodstuffs upon the Respiratory Metabolism and Growth of Human Tubercle Bacilli, R. O. Loebel, E. Shorr and H. B. Richardson, with the Technical Assistance of M. Harris, J. Bact., August, 1933, xxvi, 139.*—(*F. G. P.*)

Adverse Conditions for Respiratory Metabolism and Growth of Human Tubercle Bacilli.—In the present study the environmental features which interfere with the survival and development of the tubercle bacillus were examined. In general the methods were the same described in the preceding paper. Inasmuch as the mere transfer of organisms, with or without washing, was unsuccessful in reducing their oxygen consumption, it was necessary to try "starvation." The method was to float the bacteria on 50 cc. of non-nutrient media in 200 cc. Erlenmeyer flasks for several days. The non-nutrient solution was practically always the usual solution of saline and phosphate. In order to test the persistence of the proliferative capacity, three series of experiments were carried out in which transplants were made from the non-nutrient media at intervals up to 55 days. Although the organisms tended to remain on the surface of the solutions, with the passage of time a certain amount of sinking occurred, and it was necessary not to employ the submerged portions in any subsequent studies. The results of this study showed that the organisms reduce their metabolism to a very low level after a few days of starvation. Even after many days, the addition of adequate foodstuff restores the respiration to its original level. At the same time the growth capacity does not suffer destruction. This ability to reduce respiration to a low level with retention of respiratory and proliferative capacity is not a general property of bacteria. It is apparently one of the factors contributing to the hardiness of the tubercle bacillus. *Influence of H-ion concentration upon H37:* Under natural conditions in the body the great fixity of the blood pH does not preclude a wide range of the local pH in the vicinity of the body cells known to elaborate lactic acid, phosphoric acid and (probably) ammonia. This applies particularly to tuberculous lesions which are avascular and frequently walled off. Under artificial conditions, alterations in pH frequently occur in the cultivation of tubercle bacilli, and, indeed, preliminary treatment with strong acid or alkali is generally practised in the isolation of acid-fast bacteria. For these experiments a solution of physiological saline in which the pH was varied by the addition of various acids and bases was employed. Glycerol, 5 per cent, served as the foodstuff except in experiments with lactic acid and its sodium salt, which could themselves both alter the pH and serve as a source of food. The cultures were transferred from Long's medium except in one experiment in which a 16-day-old culture was first transferred to saline phosphate of pH 7.4 for three days before it was studied in the Warburg vessels. The results showed that at concentrations of M/150 phosphate and lactate, H37 is practically unaffected by pH conditions varying between 1.5 and 12.0. Higher molarity of lactic acid and phosphoric acid, e.g., M/15 is highly damaging to the respiration. In general, the damage done to the respiration was less at the alkaline extremes of pH than on the acid side. If respiratory damage following short exposure is related to the subsequent failure of the organism to multiply it would follow that alkali should be more satisfactory for destroying contaminants than acid in material like sputum which may contain only a few tubercle bacilli. The failure of M/150 phosphoric or lactic acid to injure the respiration is very

curious. It is unlikely that this is due to the insensitivity of the respiratory mechanism to low concentration, for M/150 sodium lactate caused a pronounced stimulation of respiration. It is more probable that either buffering occurs in the bacteria or that there is a difference in penetration between the acid and its corresponding salt. *Lactic acid production by H37:* The capacity to form lactic acid under anaërobic conditions seems to be one of the most widely diffused of cell activities. It is well recognized that this process serves as an important source of energy. The formation of lactic acid by the tubercle bacillus was determined by the manometric and chemical method. The measurement of the acid production by the manometric method depended on the following reactions: Carbohydrate to lactic acid; lactic acid plus sodium bicarbonate forms sodium lactate plus water and carbon dioxide. The displaced carbon dioxide was measured in the manometer, thereby giving the amount of lactic acid produced. Inasmuch as any acid whatsoever would liberate carbon dioxide, the manometric measurements were usually combined with a determination of the lactic acid by the Friedmann, Shaffer, Cotonio method. The results showed that the lactic acid production by H37 from glucose was extremely minute. Manometric studies showed that the same low yields are obtained with glycerol, glycerophosphate, arabinose, inositol, levulose and in biological fluids like caseous material and serum. *The effect of anaërobic exposure upon H37:* The object of this experiment was to determine the damaging effect of oxygen-lack when the organisms were subsequently removed to an atmosphere of air. Anaërobic periods of 1, 2, 4 and 16½ hours were chosen in the preliminary experiments in Warburg manometers. In order to obtain anaërobic conditions for longer periods a special vessel of 250-cc. capacity was constructed. Its main body was provided with 50 cc. of fluid, which was usually Long's medium. In the sidearm were placed 5 cc. of a solution which served to indicate that anaërobiosis was complete. After 1 to 4 days of anaërobiosis, bacteria were removed for (1) study of the respiration in the usual way in Warburg vessels and (2) culture on Long's medium. The results of this experiment showed that periods of anaërobiosis up to one day did not significantly injure the respiration of the bacteria. This coincided with the observation that the capacity to multiply was well preserved after 1 day of anaërobiosis. However, 2 days anaërobiosis on Long's solution led to the destruction of two-thirds of the respiratory capacity and 3 or 4 days of anaërobiosis to complete inhibition. The organisms failed to grow on Long's medium when transplants were made at the end of the anaërobic period. Under non-nutrient conditions there was also a complete destruction of both respiratory and proliferative capacity in a few days. *The metabolism of monocytic tissue:* The tubercle is composed almost exclusively of monocytes and their derivatives, the epithelioid cells. Since these cells surround, and, in fact, usually phagocytize the bacilli, it is important to compare their metabolic properties with those of the parasites in order to discover if mutually harmful or beneficial relations exist. The tissue was obtained from the cellular response in the omentum of the rabbit to intraperitoneal injections of phosphatide fractions of H37 and of the timothy bacillus. Only the thinner portions were selected. Calculations by Warburg's equation showed that even the centrally placed cells had an adequate supply of oxygen. Pear-shaped Warburg vessels of 15- to 25-cc. capacity were employed for these experiments, oxygen consumption being measured after the carbon dioxide was absorbed with potassium hydroxide. The tissue in the vessels was suspended in mammalian Ringer containing 0.2 per cent glucose. In addition, M/150 phosphate buffers of pH 7.4 were present except on one occasion when bicarbonate was used. The manometers were saturated with 100 per cent oxygen in order to supply an oxygen tension which would reach even the centrally placed cells of the tissue. The anaërobic formation of lactic acid was studied in an atmosphere of nitrogen, 95 per cent, and carbon dioxide, 5 per cent; the aërobic in oxygen, 95 per cent, and carbon dioxide, 5 per cent. Both the manometric and chemical methods were used for determining the amount of lactic acid formed. The results show that the tissue obtained by the intraperitoneal injection of the lipoid of H37 into the rabbit has a respiration twice as high as that of dog's muscle. At the same time it forms large amounts of lactic acid from glucose anaërobically. Applying the figures obtained in this study and others for the respiration it can be shown that in the centre of the tubercle (which is known to be avascular) a condition of complete oxygen-lack is reached when its radius is between 0.075 and 0.35 mm. Under those circumstances the monocytes and bacilli in the central area would have to depend upon some anaërobic mechanism for obtaining energy in order to survive. The monocytes can produce lactic acid to provide the necessary energy and might therefore survive. As shown by these experiments the tubercle bacilli are unable to regain respiratory or proliferative capacity after anaërobiosis and therefore might not survive. The

possibility exists, therefore, that the tubercle can bring about the cessation of growth or even the eradication of tubercle bacilli by means of this mechanism.—*The Influence of Adverse Conditions upon the Respiratory Metabolism and Growth of Human Tubercle Bacilli, R. O. Loebel, E. Shorr and H. B. Richardson, with the technical assistance of M. Harris, J. Bact., August, 1933, xxvi, 167.*—*(F. G. P.)*

Egg Media for Growing Tubercle Bacilli.—A medium for the growth of tubercle bacilli containing the optimum amount of efficient nutrients has not yet been described. The majority of investigators prefer a sterile autoclaved potato-cylinder medium or the inspissated egg medium. This is a detailed study of the value of egg nutrients for tubercle bacilli with the use of quantitatively graded fine suspensions of bacilli. The number of bacilli per mgm., moist weight, was verified and found to be approximately one billion. From 3 to 10 mgm. of moist culture was placed in the bottom of a sterile graduated 15-cc. centrifuge tube. This mass was thoroughly ground and sterile physiological saline (pH 7.0) was added drop by drop and the mixture kept free from lumps. The final suspension was uniformly opalescent, without lumps and contained 1 mgm. of bacilli per cc. It was found that further dilutions of bacilli to the point when the suspension contained 0.000,000,001 mgm. of the original bacillary mass would yield consistently positive cultures on good nutrient media. The two natural fractions of egg, the white and the yolk, were then studied with respect to their nutrient values. In general it was shown that inspissated egg white is a poor nutrient for human and bovine bacilli as compared with whole egg or egg yolk. Egg yolk with a natural pH of 6.5 or with an adjusted pH of 7.0 is a better nutrient than is whole egg. The pH of inspissated nutrient media showed no significant change after incubation for three months at 37°C. Since many of the recommended media contain broth, a study, by quantitative methods was made of its evaluation. The results indicate that broth can be dispensed with in the preparation of egg nutrient media for growing human and bovine bacilli. For an empiric isolation test and to compare the egg medium with a known satisfactory medium a study of 100 human sputa, negative microscopically, was made. The results obtained compared well with those obtained on potato medium. Next, a study of five different strains of bacilli was made on various types of media: (1) inspissated yolk-glycerol-water; (2) yolk-glycerol-broth-agar not inspissated; and (3) inspissated yolk-glycerol-broth agar. It showed that a medium prepared from egg yolk alone and inspissated is far superior to the glycerol-agar medium. Inspissation or satisfactory sterilization of a nutrient medium does not injure the medium. It was further determined that the addition of water to 25 per cent of weight has no detrimental effect on nutrient media and does serve to maintain adequate moisture. Since egg yolk is rich in phospholipins a study was made to determine whether the addition of glycerol was necessary to the egg-yolk medium. It was found that the addition of glycerol was a decided advantage in favoring the growth of recently isolated human tubercle bacilli. It was shown also to be of advantage in the growth of glycerophilic strains of recently isolated bovine bacilli and a distinct disadvantage in the nonglycerophilic strains. No advantage was found to be gained by the mixture of the two good nutrients, egg-yolk and potato. Media containing various proportions of the two were studied. The ranges of the pH of egg-yolk medium which allowed good growth of bacilli were studied extensively. It was found that with heavy seedings growth can be obtained from pH 5.0 to pH 9.0; with lighter seedings growth occurred from pH 6.0 to pH 7.8; but it was most abundant near the neutral point. The concluding study of the components of egg medium is that of dyes added to facilitate the early finding of colonies of tubercle bacilli. Among others trypan-blue, alkali-blue, congo-red, malachite-green and nigrosin were found to be without tuberculostatic effect in egg-yolk media.—*The Nutrient Quality of Eggs for Growing Tubercle Bacilli, H. J. Corper & M. L. Cohn, Am. J. Hygiene, July, 1933, xviii, 1.*—*(J. F. B.)*

Greening of Media by Tubercle Bacilli.—When certain strains of tubercle bacilli are grown on Sauton medium which is colorless, a green color develops. This process is due to the iron in the medium. The change in color is not specific for certain strains of tubercle bacilli.—*Über die Vergrünung des Sauton-Nährbodens durch säurefeste Bacillen, J. Schubert, Beitr. z. Klin. d. Tuberk., July 29, 1933, lxxxiii, 220.*—*(M. P.)*

Greening of Media by Tubercle Bacilli.—The green discoloration which is produced by certain tubercle bacilli while growing on Sauton medium is not characteristic for specific strains and cannot be used for the identification of certain strains.—*Über die Grünfärbung des Sauton-Nährbodens durch Tuberkelbacillen, H. Lenhartz, Beitr. z. Klin.*

d. Tuberk., July 29, 1933, lxxxiii, 237.—(M. P.)

Atypical Acid-Fast Organisms.—An atypical acid-fast organism was isolated from the urine of a patient with renal tuberculosis. It is a fast-growing acid-fast organism which develops in perfectly smooth colonies, and which consists of small rods and many minute acid-fast and non-acid-fast granules. It was thought that this organism, on account of its many dust-fine granules, might be particularly suitable for filtration experiments. Berkefeld filtrates from broth and agar cultures were prepared and were cultured in serial plant transplants according to Hauduroy's technique. On the third to tenth transplants, minute colonies made their appearance on the plates. These results were obtained with regularity with about 12 different filtrates. The method by which these organisms were obtained, the regularity of their occurrence, the size of the colonies, their acid-fast characteristics and their polymorphism, all combined to create the impression that they were "G" colonies. These organisms bear a close similarity to some of the bacterial forms that have been described as atypical or developmental forms of the tubercle bacillus. In control experiments, sterile broth was substituted for bacterial filtrates, and the same serial plate transfers were made with broth. The small colonies described above, appeared with great regularity. It was then ascertained that the material, media, glass-ware, filters, did not contain these organisms, but that the air in the laboratory did. These findings add nothing to the question whether tubercle bacilli have a filterable phase, or developmental forms other than the classical Koch bacillus. They simply indicate some pitfalls that may be encountered in this type of work.—*IV. Atypical Acid-Fast Forms. II. Some Observations on Filtration Experiments, M. Pinner, J. Bact., June, 1933, xxv, 576.—(F. G. P.)*

Atypical Acid-Fast Bacillus.—At the request of Professor S. Lyle Cummins, the "M" strain of acid-fast bacillus, isolated from the sputum of a patient with acute pulmonary disease, was studied. When introduced intravenously or intraperitoneally in relatively large doses, it was found to be pathogenic for rabbits and mice, only slightly pathogenic for guinea pigs, and not at all for fowl and frogs. The cultures on glycerine-egg grew much larger than on egg medium. The colonies were surrounded by a thin, barely-visible, marginal growth with fern-like markings, beneath which the medium acquired a dark color on exposure to light although the growth itself remained unchanged. In subculture the strain grew fairly rapidly and abundantly. The strain is distinct from any of the acid-fast strains of bacilli obtained from tubercle-like lesions in cold-blooded animals or any of the saprophytic acid-fast bacteria.—*Observations on the "M" Strain of Acid-Fast Bacilli, A. S. Griffith, Tubercle, November, 1933, xv, 53.—(T. O. R.)*

Atypical Acid-Fast Bacillus.—An acid- and alcohol-fast bacillus, referred to as the "M" strain, was isolated from a patient in whom the clinical, roentgenological, and haematological manifestations resembled those of acute phthisis. The microörganism is homogeneous with Ziehl's stain and granular with Much's or Gram's stain. It is short, long, or curved, depending on the age and on the medium. It is suspended much more readily than is the tubercle bacillus. Cultures on solid media are at first white and later become slightly yellow. Cultures retain their vitality for a long time. The bacillus is not markedly pathogenic for guinea pigs, rabbits, or pigeons. It can, however, produce chronic abscess-formation and can survive for long periods in the tissues. The results from the intracutaneous injections of "M" tuberculin in laboratory animals and in human beings were not sharp nor conclusive. The patient from whom the "M" strain was isolated refused to be tested by the tuberculin but consented to bronchoscopy. During this procedure some fluid was aspirated and lipiodol introduced. The patient made an uneventful recovery. This case emphasizes the fact that the isolation of acid-fast bacilli from the sputum is not conclusive proof of tuberculosis and that the investigation of cultural characteristics in all doubtful cases is a necessity.—*An "Acid-Fast" Other than Koch's Bacillus Cultivated from Sputum, S. L. Cummins & E. M. Williams, Tubercle, November, 1933, xv, 49.—(T. O. R.)*

Variant Forms of Tubercle Bacilli in Same Patient.—From the sputum of a patient with tuberculosis a human strain of tubercle bacilli was isolated. At the same time a variant strain was isolated from the blood-stream of the same patient. The bacilli from the sputum infected guinea pigs, but did not infect rabbits. The bacilli, from the blood-stream infected both guinea pigs and rabbits. These latter bacilli behaved in the same manner as bacilli isolated from guinea pigs inoculated with the so called filtrable virus.—*Caractères respectifs des bacilles tuberculeux isolés au même moment des crachats et du sang d'un malade atteint de*

tuberculose pulmonaire, J. Beerens, Compt. rend Soc. biol., January 20, 1934, cxv, 285.—(M. T. W.)

Filtrable Forms of Tubercle Bacillus.—Suspensions of virulent human and bovine tubercle bacilli in M/15 sodium oxalate, pH 8.5, or in bouillon, pH 7.4, were filtered through Berkefeld V or N filters, Chamberland L2 or L3 filters, or through Szigmondy membrane filters, at a negative pressure of 200 to 500 mm. of mercury. Ten to 12 cc. of filtrate was obtained in 2 minutes with the V filters, and after 8 to 9 minutes with the N filters. As controls *V. percolans* and *B. prodigiosus* were used and antishiga bacteriophage was used to determine the rate of absorption. The sediment obtained after centrifugating the filtrate for one hour was stained in part by Ziehl-Neelsen, Much and Gram stains, and in part planted upon haematin-egg medium and glycerol-potato and inoculated into guinea pigs. With Berkefeld V filters and Chamberland L2 filters control organisms usually filtered through, and tubercle bacilli were frequently demonstrable microscopically, culturally, and by means of guinea-pig inoculation in the filtrate. With Berkefeld N, Chamberland L3 and Szigmondy membrane filters no conclusive proof of a filtrable form of tubercle bacillus was demonstrable. In a second experiment filtrates of tubercle bacilli and filtrates of tuberculous tissue were injected into the cervical lymph nodes of guinea pigs. In some instances single or small clumps of acid-fast bacilli were noted, but no increase of these organisms was obtained upon further animal passage. In a third experiment filtrates from cultures of tubercle bacilli were injected into the peritoneal cavity of guinea pigs in which peritonitis had been induced by the injection of a mixture of disodium phosphate and calcium chloride. No acid-fast bacilli were found either in the lymph nodes or peritoneal exudate of these guinea pigs. It is concluded that tuberculosis produced by filtrates is due to the passage through the filter of an occasional tubercle bacillus. These experiments lend no corroboration to the view that an ultravirus form of the tubercle bacillus exists.—*Untersuchungen über die Filtrierbarkeit der Tuberkelbazillen, A. W. Downie & G. Meisner, Zentralbl. f. Bakt., January, 1934, cxxx, 465.—(J. D. A.)*

Loewenstein's Technique.—Loewenstein's method of cultivation is based on his discovery that the tubercle bacillus survives in 15 per cent sulphuric or hydrochloric acid. The fundamentals for success in cultivating the microörganism from the blood-stream are the complete removal of haemoglobin, the thorough shaking of the blood sediment before and during every step of the procedure, the right medium, moist and recently prepared, and the thorough stirring of the grey deposit before drawn up in the sterile pipette prior to its introduction to the medium. The details of the procedure for cultivation of microörganisms from the blood stream, tissue, urine, pus and faeces are presented.—*Loewenstein's Technique of Cultivating the Tubercle Bacillus from the Blood-Stream and from Other Infected Material, A. W. Smith, Tubercle, August, 1933, xiv, 502.—(T. O. R.)*

Identification of Tubercle Bacilli Cultured by Loewenstein.—Loewenstein's success in culturing tubercle bacilli from the blood has been contested on the ground that the acid-fast bacilli found in the culture-tubes were not, except in a relatively few instances, unequivocally identified as tubercle bacilli. At the writer's request Loewenstein sent a series of his recent blood-cultures for investigation. There were 24 strains, 18 of which were primary cultures obtained in February and March, 1932, and the remainder were subcultures dating from 1930 and 1931. The patients from whom the cultures were obtained were diagnosed as suffering from skin tuberculosis (11 cases), polyarticular rheumatism (8 cases), disseminated sclerosis (2 cases), and dementia praecox, renal tuberculosis and phthisis pulmonalis (each 1 case). All the strains were found to be typical tubercle bacilli. Seventeen were culturally and in virulence for the guinea pig, identical with eugonic human tubercle bacilli, and 7 were typical avian strains.—*A Note on Prof. E. Loewenstein's Blood Cultures for Tubercle Bacilli, A. S. Griffith, Lancet, September 9, 1933, ccxxv, 592.—(J. S. W.)*

Protein Fractions of Tubercle Bacillus.—Bacilli frozen and dried or killed by immersion in acetate buffer at pH 4.0 were extracted in the cold with acetone and ether and then dried and ground in a ball-mill until intact cells could no longer be observed. They were again extracted with acetone and ether, and then successively with solutions at pH 4.0 (Fraction C), 6.5 (D), 8.3–8.5 (E), 9.0 (F) and 11.0 (G) and finally with 0.1, 0.2 and 0.5 normal sodium hydroxide (K, K^{I}, K^{II}). The extractions were made under conditions designed to minimize enzyme action and denaturation and to effect a separation from the specific polysaccharides. The extracts were repeatedly precipitated with acetic acid and dried. The fractions were then analyzed for nitrogen, phosphorus,

basic ash and optical rotation, and precipitin tests were made against antisera to the D and K fractions. No fraction was obtained as a definite chemical individual, but the results indicated that there is a real antigenic distinction between the D and K fractions. Furthermore, there was a decrease in the phosphorus content of the fractions with increase in the alkalinity of the successive extraction media.—*Protein Fractions of the Human Strain (H-37) of Tubercle Bacillus, M. Heidelberger and A. E. O. Menzel, Jour. Biol. Chem., March, 1934, civ, 655.*—(*F. B. S.*)

Carbohydrate Metabolism of Tubercle Bacilli.—In order to determine the carbohydrate metabolism of tubercle bacilli, the organisms were grown on a synthetic medium which did not contain any asparagin. In this medium growth occurred only in the presence of glycerol. Lactose, glucose levulose and starch were not utilized by tubercle bacilli unless the medium contained glycerol in addition to these carbohydrates. —*Über die Ausnutzung der Kohlehydrate für das Wachstum der Tuberkelbacillen, L. M. Model, Beitr. z. Klin. d. Tuberk., July 29, 1933, lxxxiii, 214.*—(*M. P.*)

Effect of Juice from Muscles and Thyroid on Tubercle Bacilli.—It is a well-known fact that striated muscles and the thyroid gland are highly resistant to tubercle bacilli. It was therefore of interest to find out whether the organs contain any bactericidal or bacteriostatic substance. It was definitely established that the juice of these organs has no impeding effect on the growth of tubercle bacilli.—*Die Einwirkung von Pressäften des Muskels und der Schilddrüse auf Tuberkelbacillen, H. Feurig, Beitr. z. Klin. d. Tuberk., September, 1933, lxxxiii, 452.*—(*M. P.*)

Heat-Stable Antigens (*Koktigens*) from Tubercle Bacilli and Homologous Antibodies.—By injecting rabbits intravenously with the residue of heated tubercle bacilli, 10–15 times, one obtains an antiserum which reacts specifically with the *Koktigen* (watery extract obtained by boiling the bacilli for a half hour). By the use of appropriate antisera in the precipitin reaction the *Koktigens* from human and bovine tubercle bacilli and from other acid-fast bacilli, such as the butter and smegma bacillus, can be differentiated. Furthermore the bovine is more toxic on intravenous injection than is the human type *Koktigen*. The *Koktigen* is a haptene in the sense of Landsteiner. It gives practically no tuberculin skin reaction and no protein tests, but does give a positive reaction for polysaccharide and is fairly resistant to half-normal sodium hydroxide and hydrochloric acid. It gives complement fixation. The presence of formalin checks the reaction between *Koktigen* and antiserum. The *Koktigen* is very resistant to heat at 100°; it is stable on long standing; it precipitates with concentrated alcohol, and it filters through collodion membranes. The antisera can be preserved by means of *Carvasept* (*monochlorcarvacrol*) without noticeable loss in antibody content. The *Koktigen* can be released from combination with the homologous antibody by heat and can then again be detected with antiserum. Accordingly antibody can be detected in sera of tuberculous guinea pigs.—*Kochbeständige Antigene ("Koktigene") aus Tuberkelbazillen deren homologe Antikörper, F. P. Leusden, Zeit. f. Immunitätsforsch., October 5, 1933, lxxx, 279.*—(*F. B. S.*)

Persistence of Tuberculous Infection.—The entire series of autopsies performed at The Mayo Clinic over a period of six years (1926–1931) were reviewed in order to determine the relative incidence of the various classes of tuberculous processes. The results represent the "run" of a moderately efficient mill. In the study consideration was given to the data of family and clinical history, physical examination, and the postmortem study both gross and microscopical. No attempt was made to verify the presence of the tubercle bacillus either by staining or animal inoculation. The final criteria for the diagnosis of active disease rested on histological evidences of activity on the part of the cells in the tuberculous area, such as foci of connective tissue proliferation, giant cells and agglomeration of lymphocytes. Such standards do not entirely eliminate the possibility of errors, but such sins of commission are more than outweighed by the sins of omission. During the six years mentioned 3,306 postmortem examinations revealed an incidence of some form of tuberculous lesion in 2,064 (62.43 per cent). Of this group in 89 cases tuberculosis was either a principal or contributing cause of death, and in 1,725 cases the tissues examined contained apparently entirely healed tuberculous processes. In 134 cases there were found active lesions which were not recognized clinically. They total 4.05 per cent of the total examinations. These are reported according to the age-decade. The second and third decades show the highest incidence in early life (approximately 6.8 per cent) and the ninth decade in late life (9.3 per cent). These results are sufficiently impressive to reemphasize the extreme tenacity of tuberculous infection.—*The Persistence of*

Tuberculous Infections, H. E. Robertson, Am. J. Path., Supplement, 1933, ix, 711.—(J. S. W.)

Tuberculosoids.—The term "tuberculosoid" is used to indicate disease processes which are caused by tubercle bacilli but in which the characteristic histological changes are absent. Most of such processes are of an inflammatory nature and they may be caused by typical tubercle bacilli, by "splitters" or granules, or by dead bacilli or by bacterial toxins. It is likely that some of these diseases are produced by the filterable phase of the tubercle bacillus. On account of the nonspecificity of the tissue alterations and by virtue of the frequent impossibility to demonstrate atypical forms of the tubercle bacillus, the diagnosis of tuberculosoids must be made essentially on the basis of circumstantial evidence. Diagnostic criteria of the first order include the demonstration of tubercle bacilli, the observation that the disease in question is closely dependent upon a demonstrable tuberculous process and upon serological evidence in the absence of typical tuberculosis, syphilis and malaria. Diagnostic criteria of the second order are the simultaneous or successive appearance of tuberculosoid and a benign typical tuberculosis, focal reactions to 0.0015 gm. tuberculin, intense tuberculin skin reactions in the absence of typical tuberculosis, mononucleosis of a local exudate and satisfactory response to specific treatment. The following clinical pictures are discussed as tuberculosoids: tuberculous rheumatoid, tuberculous polyserositis, tuberculous hepatic sclerosis and Banti's syndrome, pulmonary tuberculosoids, Menière's syndrome with tuberculous aetiology, ocular tuberculosoids, and tuberculosoids of the nervous system. For each group of diseases, case histories are cited. The final diagnosis in the majority of cases is reached by exclusion. In the group of "tuberculous rheumatoid," polyarthritis is illustrated and it is emphasized that its frequency is probably overrated. Diagnostically it is important that the response to salicylates is poor and that cardiac involvement is very rare. Some cases terminate with the development of a characteristic articular tuberculosis. In the group of pulmonary tuberculosoids, cases are described in which only the intrapulmonary lymph tissue is involved. Ocular tuberculosoids include scrophulous involvement of the conjunctiva, corneal ulcers, opacities in the corpus vitreun, chorioretinitis, uveitis, iritis, retinal haemorrhages and retrobulbar neuritis.—*Tuberkulosoide, H. Gerhartz, Beitr. z. Klin. d. Tuberk., December, 1933, lxxxiv, 26.—(M. P.)*

Phlyctenular Conjunctivitis.—Although a wide variety of conditions have been proposed as the cause of phylctenulosis, tuberculosis in the vast majority of cases forms the aetiological basis. Experimentally the characteristic nodules in the conjunctiva have been produced only in tuberculous animals. Histological studies that have been made show a resemblance to certain forms of tuberculous tissue:—collections of lymphocytes, a few epithelioid cells, and occasionally multinucleated cells, although tubercle bacilli or Langhans cells have not been found. In the group of children with phlyctenulosis reported here, the tuberculin reaction was positive in all but 2 of the 60 children who were tested. Of the 2 who were negative one had been tested by the Pirquet method, and in the other the phlyctenular conjunctivitis was atypical. X-ray pictures revealed evidence of tuberculosis in 48 of the 71 children studied. The importance of the roentgenographic examination of the neck and abdomen in a search for calcified lymph nodes was substantiated in this series. In 18 children these were the only sites of roentgenological evidence of tuberculosis. It is possible that there is a relatively uncommon form of conjunctivitis caused by some other factor than tuberculosis which is clinically difficult at the onset to distinguish from tuberculosis phlyctenulosis.—*Tuberculosis: III. Phylctenular Conjunctivitis; Its Relation to Tuberculosis as Shown by Roentgenologic and Clinical Observations in Seventy-One Cases, M. Goldstein & C. L. Wood, Am. J. Dis. Child., January, 1934, xlvii, 171.—(M. D.)*

Treatment of Tuberculous Laryngitis.—In evaluating any method of treatment of tuberculosis of the larynx it is necessary to have proper controls in order to eliminate the possibility of spontaneous arrests or cures, to consider the social and economic status of the patient, the age of the patient, and the stage of the disease. Inasmuch as laryngeal tuberculosis is secondary to pulmonary tuberculosis, it is of paramount importance to treat the latter. Therefore, the various collapse procedures, as artificial pneumothorax and phrenic avulsion, frequently produce very striking beneficial results in both conditions. Any infection of the nose or throat should be adequately treated. In certain carefully selected cases removal of septic tonsils may be beneficial. Vocal rest is the most universally recognized form of local treatment and frequently, in conjunction with a sanatorium regimen, proves sufficient. Galvanocautery is falling into disuse. It is chiefly indicated for dysphagia caused by a small ulcer. Dia-

thermy may cause extensive sloughs. General carbon-arc-light baths are beneficial only for early laryngeal cases in patients of good physique with slight pulmonary involvement. In poorly nourished and emaciated cases and in those with extensive pulmonary infection, carbon-arc-light treatment does no good and may do a great deal of harm. At present the efficacy of ultraviolet light is being tested at the Colindale Hospital on a limited number of patients by using the Kromayer model no. 2 water-cooled mercury-vapor lamp, with a quartz laryngeal applicator, as designed by Doctor William Beaumont. The results thus far are promising. Chaulmoogra oil applied locally to the larynx has a soothing but no curative effect. Sanocrysin has a definitely beneficial effect in certain cases, but the difficulty lies in the selection of these cases. Tracheotomy is only rarely necessary. The simplest means of relieving dysphagia is by the insufflation into the larynx of a powder consisting of equal parts of orthoform and anaesthesin. In more advanced cases, the blocking of the superior laryngeal nerve with alcohol gives excellent results. The viewpoints, in respect to the above therapeutic procedures, of many physicians are reviewed.—*The Treatment of Tuberculosis of the Larynx, R. S. Stevenson, Brit. M. J., November 25, 1933, no. 3803, 960.*—(*T.O. R.*)

Heliotherapy in Laryngeal Tuberculosis.—By a combination of universal carbon-arc light baths and local intervention (galvanocauterization, excisions, etc.) better results have been produced than heretofore attained in the treatment of tuberculous laryngitis. St. Clair Thomson found no striking effect on the laryngeal lesion from light therapy. Because of difference in technique his results cannot be compared with the authors'. In a well-ventilated hall the patients are exposed, in the recumbent position, to a series of three carbon-arc lamps, each of 25 amperes. Exposures are gradually increased until one and a half hours four times a week or two hours three times a week are reached. Intervals of rest of one to two months following each series of 35 to 50 baths are prescribed. No injurious effects on the lungs are noticed, although there may be a more rapid destruction of the affected pulmonary tissue. This is interpreted as a more rapid passage through phases which the lesion must anyhow be expected to pass. Local application of light to laryngeal lesions should be abolished. In 251 out-patients healing of the laryngeal lesion was brought about in 59.4 per cent. In ulcerative cases the percentage of healing was 56.—*Effects of Light Treatment on Laryngeal Tuberculosis, O. Strandberg & J. Gravesen, Lancet, January 20, 1934, ccxxvi, 128.*—(*B. T. McM.*).

Treatment of Tuberculous Laryngitis.—In the Sanatorium Seltersberg for Tuberculosis of the Upper Respiratory Tract, 291 patients were seen during the first three years. Of these, 220 had pulmonary and laryngeal tuberculosis, 16 had laryngeal tuberculosis without demonstrable pulmonary lesions, and 46 had pulmonary tuberculosis with nonspecific affections of the larynx. Of 112 patients with slight and moderately severe forms of laryngeal tuberculosis 75.5 per cent were definitely improved and 20 per cent of this group were clinically cured. Of 117 patients with severe laryngeal tuberculosis, clinical cure was obtained in three cases, and marked improvement in 18.8 per cent. It is erroneous to assume, as it is usually done, that the development of laryngeal and pulmonary tuberculosis is parallel. It was observed, in many cases, that one of the two lesions may improve while the other progresses. But, the severity of pulmonary tuberculosis and the general condition of the patient are important prognostic factors. The success of the treatment depends on early diagnosis, and in this connection it is important to point out that laryngeal tuberculosis may be asymptomatic for a considerable length of time, so that early diagnosis can only be assured by routine laryngeal examination of all tuberculosis patients. In addition to the general treatment, local treatments with various chemicals, curretage, galvanocautery, coagulation and local radiation may be used, strictly dependent upon the individual indication.—*Die Behandlung der Kehlkopftuberkulose und ihre Erfolge, A. Brüggemann, München. med. Wchnschr., March 16, 1934, lxxxiv, 393.*—(*M. P.*)

Prognosis of Tuberculous Laryngitis.—General factors which influence the prognosis of tuberculous laryngitis are the type of pulmonary lesion and the patient's age, resistance, and temperament. The combination of a rapid sedimentation rate, a high monocyte count, and a low lymphocyte and eosinophile count, which does not show any tendency to change, signifies a poor resistance, and the laryngeal lesion will not improve as long as this state continues. The more fibrotic the pulmonary condition, the less severe is the laryngeal activity and as fibroid phthisis is more frequent in patients over 40, the outcome is less grave the older the patient becomes. An undisciplined or a despondent, morose individual will often fail to improve despite limited disease. A

nonulcerative laryngeal lesion has a better prognosis than an ulcerative one. Four types of laryngeal lesions are recognized. The extrinsic type, which includes those cases with arytenoepiglottic involvement with massive infiltration, oedema of the epiglottis, and pyriform swelling of the arytenoids, has a poor prognosis. In patients younger than 30 the outlook is hopeless, and those older than 40 respond moderately to only temporary improvement. The intrinsic type, which includes cases with corditic and interarytenoid infiltration, has a comparatively good prognosis. If, however, dysphagia develops or the infiltration extends to the arytenoids or the ventricular folds, the outlook becomes unfavorable. The localized type, in which the infiltration is limited to one particular area, has a good prognosis. The lupoid type, which includes cases with granular, papillary, and smooth, defined tuberculomata, responds favorably to treatment. In regard to the site of onset and direction of spread, the most favorable order is from the vocal cords to the interarytenoid region. If the infiltration invades any part of the soft palate or fauces, no matter how slight the area of laryngeal involvement may be, the outlook is hopeless. The presence of concurrent diseases will influence the prognosis according to their general effect on the body.—*The Prognosis of Tuberculous Laryngitis, F. R. G. Heaf, Brit. M. J., November 25, 1933, no. 3803, 966.*—(*T. O. R.*)

Pleural Calcification.—An emaciated, white female of 62 years entered the hospital complaining of severe dyspnoea, paralysis of both lower extremities, and loss of sphincter control. Her symptoms began fifteen years previously with attacks of dyspnoea, and had been stationary for the last five years. On physical examination, the thorax was emphysematous and asymmetrical, with a marked fullness on the left side. Expansion of the left side was absent. Posteriorly there was a compressible, nontender swelling extending from the level of the sixth to the twelfth dorsal vertebra. Roentgenological examination revealed extensive calcification of the pleura with partial destruction of the eighth, ninth, and tenth dorsal vertebral bodies and ribs. A dorsal laminectomy with decompression was done. The patient recovered from the operation, but died one month later of hypostatic bronchopneumonia. At autopsy, the entire parietal pleura was found to be calcified and so closely adherent to the eighth, ninth, and tenth ribs and dorsal vertebrae, that these structures were almost entirely eaten away by the necrosing process. At the level of the destroyed vertebrae, there was a scoliosis of the spine to the right, causing compression of the cord, which was further encroached upon by the disease meninges, the latter being markedly thickened by an inflammatory fibrosis. The calcified shell contained about 1000 cc. of serous fluid and a small fibrous mass which represented the left lung. A guinea pig inoculated with the contents of the calcified shell developed tuberculosis. A review of the literature indicates the incidence of pleural calcification to about 0.2 per cent. The aetiology of this condition has been ascribed to tuberculosis, haemothorax, pleurisy, and empyema. Roentgenological examination offers the greatest hope for the diagnosis of this condition during the life of the patient, but it is highly important to use rays of greater penetrability than is usual for the ordinary roentgenogram of the chest.—*Pleural Calcification: Calcification of the Entire Parietal Pleura, with a Report of a Case, H. A. Hill, Radiology, November, 1933, xxi, 431.*—(*T. O. R.*)

Atypical Dry Pleurisy.—There are certain atypical forms of pleurisy, namely, the interlobar, the mediastinal, the paravertebral and the diaphragmatic, which are seldom diagnosed by physical and clinical signs alone but may be recognized by the radiological method, provided the proper X-ray technique is used. This consists in the study of the chest in both the anteroposterior and the lateral positions, enabling one to determine the exact relationship of abnormal shadows to the interlobar fissures, the mediastinal structures, the spine or the diaphragm. Thickening of the interlobar pleura in the horizontal fissure is more readily recognized in the anteroposterior position of the chest, while thickening of the interlobar pleura of the oblique fissures is more readily recognized in the lateral position of the chest. The roentgen characteristics of dry fibrinous pleurisy depend on the region involved and the extent of the lesion. In the early cases one may find only a dense line due to thickening of the visceral pleura. In more advanced cases one may find an elongated, more or less oval dense shadow. Abnormal shadows due to mediastinal or paravertebral pleurisy may show in the anterior view a dense shadow, which is usually narrow along the borders of the heart or spine. In the lateral position of the chest the abnormal shadow will be found to overlap the heart or spine, or both, depending on the extent of the area involved. In diaphragmatic pleurisy the diaphragm is found elevated and its outline is more or less irregular as a result of a fibrinous deposit. The study and correlation of the clinical, physical and radiological

examinations have resulted in the recognition of certain symptoms and signs that are frequently associated with dry atypical pleurisies. These are as follows: moderate indisposition; dry cough; slight elevation of temperature; very little change in the respiratory and pulse-rate; moderate leucocytosis. With the exception of diaphragmatic pleurisy, there is no pain in the chest.—*Atypical Forms of Dry Pleurisy: a Radiologic and Clinical Study, Samuel Brown, J. Am. M. Ass., January 20, 1934, cii, 193.—(G. L. L.)*

Interpleural Communication.—The authors report a case in which the introduction of air into the left pleural cavity produced an increasingly demonstrable pneumothorax collapse of the right lung, with no collapse of the left. After introduction of air, manometric readings showed that the intrapleural pressures on the two sides increased together. The patient died of cardiovascular renal complications 27 months after a left-sided thoracoplasty had been performed. No channel of interpleural communication could be demonstrated postmortem. The left lung was found to be atelectatic, like beefsteak in consistency, with considerable scar tissue and no evidence of cavity or active tuberculosis. The histological characteristics were those of considerable dense fibrous tissue in areas of former disease, with elsewhere more diffuse scattering of fibres in alveolar walls and alveolar exudate. The large bronchi showed much lymphoid-cell infiltration, the smaller ones distorted or obliterated by scar-tissue, with in many instances loss of mucosa in part or *in toto*. In nondiseased areas there was partial collapse to total atelectasis. The capillaries in the alveolar walls throughout were large and the arteries throughout the lung greatly thickened, with an abnormal amount of fibrous and elastic tissue.—*Communication between the Two Pleural Sacs, with Lungs Showing Tuberculosis Healed After Thoracoplasty, C. R. Smith & H. S. Willis, J. Am. M. Ass., October 14, 1933, ci, 1224.—(G. L. L.)*

Tuberculous Gastric Ulcer.—*Case Report:* A man, forty-nine years old, died of gastric haemorrhage. The necropsy showed a caseous pneumonia with cavity-formation in the right, middle and lower lobes, extensive caseation of the hilar and perigastric lymph nodes, and a large ulcer at the lesser curvature of the stomach. The ulcer had invaded all layers of the stomach. For reasons that are discussed in some detail, it is assumed that the ulcer was produced by lymphatic metastasis from the perigastric lymph nodes.—*Über einen Fall von lymphogen entstandenem tuberkulösem Magengeschwür, J. Beniamin, Beitr. z. Klin. d. Tuberk., December, 1933, lxxxiv, 249.—(M. P.)*

Vitamine-C Lack and Intestinal Tuberculosis.—Intestinal tuberculosis is one of the most frequent and serious complications of phthisis. The swallowing of sputum laden with bacilli cannot be the sole cause of the condition since many patients swallow such sputum for years without developing intestinal lesions. Numerous attempts have been made to produce intestinal tuberculosis in the guinea pig by feeding either tuberculous sputum or tuberculous material, but success has been claimed by only a few workers. One of the authors has shown that patients with intestinal tuberculosis frequently make rapid and permanent improvement of their intestinal condition when given codliver oil and tomato juice in addition to the regular hospital diet, while similar patients on hospital diet alone do badly. Also, the addition of these vitamin-carriers to the regular diet appeared to be a valuable prophylactic measure. Experiments were undertaken in guinea pigs in an attempt to determine the rôle of certain vitamine-deficiencies in the production of intestinal tuberculosis. After some preliminary experiments, a large series of adult guinea pigs (52) was put on a vitamine-poor basic diet without fruit or fresh vegetables. One-half was kept as the nontuberculous controls. Some of these received a basic deficient diet only; another group, a basic diet plus 0.3 cc. of codliver oil (vitamines A and D) daily; a third group a basic diet plus 10 cc. of tomato juice (vitamine C) daily; and a final group a basic diet plus 0.3 cc. of codliver oil and 10 cc. of tomato juice daily. The remaining 26 guinea pigs were sensitized by subcutaneous injections of nonvirulent human tubercle bacilli (R1) and subsequently fed on 0.5 cc. of tuberculous sputum given daily with a tuberculin syringe. These guinea pigs were grouped and fed as in the control series. The normal guinea pigs kept on a vitamine-poor diet died in from 6 to 16 weeks with a variety of lesions ascribable to the deficient diet. Two had duodenal ulcers. Codliver oil did not prevent the development of these lesions, but the addition of 10 cc. of tomato juice daily to the basic diet protected the animals completely from all signs of deficiency disease. Sensitized guinea pigs maintained on the basic diet and fed tuberculous sputum developed ulcerative tuberculous lesions in the intestines in 5 out of 10 cases. When codliver oil was added to the basic diet, 4 out of 6 animals developed ulcerative intestinal tuberculosis. The animals of

these two groups died between the second and fifth months. When, however, the basic diet was supplemented with 10 cc. of tomato juice daily, the animals did well and were killed in the fifth month at the end of the experiment. Only one out of ten showed any traces of intestinal tuberculosis, although the spleen, liver and lungs of all showed considerable disease. Another series of guinea pigs (46) was grouped and fed similarly to the first series. With the exception of 10 animals, all the guinea pigs had one month previously received three doses of approximately 1 mgm. of virulent human tubercle bacilli (H37) by mouth over a period of five days. Each group, besides its special diet, received 0.5 cc. of tuberculous sputum daily. The 10 guinea pigs which had not been given the H37 strain by mouth received a limited amount of cabbage leaves in addition to the basic diet. The animals showed much more extensive generalized disease than in the first experiment in which the animals had been previously treated with R1 avirulent bacilli. There were also more intestinal ulcers in the animals fed on a deficient diet; and it was more difficult to protect these animals against the lesions in the intestines even when adequate diet was given. In the deficient-diet group consisting of 21 animals, the intestinal tract of only one animal was found normal at necropsy. In the protected group (25 animals) 17 animals had normal intestinal tracts at necropsy, 6 had non-ulcerative tubercles in the ileum, while 2 presented open tuberculous ulcers. The gross and microscopical appearance of the tuberculous lesions in the intestines of the guinea pig are similar to the tuberculous intestinal lesions in man. In order to determine the part played by vitamine-C deficiency in the pathogenesis of intestinal tuberculosis in guinea pigs, the intestinal lesions due to scurvy were compared with those of tuberculosis. In the early scorbutic lesions submucosal haemorrhage is the outspoken feature; the mucosa overlying the area of haemorrhage becomes necrotic, sloughs and forms ulcers. The initial tuberculous lesion also occurs in the submucosa and apparently goes on to ulceration when there is not sufficient vitamine C (tomato juice) in the diet. Apparently an adequate supply of the vitamine protects the guinea pig against ulcerative intestinal tuberculosis, even in the presence of submucous tubercle. The guinea pig and man appear to be similar in their vitamine-C requirements. The experiments do not explain the clinical value of codliver oil in intestinal tuberculosis. Man is quite susceptible to vitamines A and D, while the guinea pig is not. It is thus possible that a deficiency of vitamines A and D (the vitamins of codliver oil) plays a part in the development of intestinal tuberculosis in man and not in the guinea pig. It is concluded that the ingestion of tubercle bacilli by the guinea pig under the conditions of the experiment, is not the sole factor in the production of intestinal tuberculosis. Apparently there must be, in addition, a lack of vitamine C in the food, for an adequate supply usually prevents ulceration.—*The Relation of Vitamin C Deficiency to Intestinal Tuberculosis in the Guinea Pig, M. McConkey and D. J. Smith, J. Exper. Med., 1933, lviii, 503.*—(*J. S. W.*)

Diagnosis and Treatment of Intestinal Tuberculosis.—Tuberculosis of the intestine may exist without symptoms, or suggestive symptoms may be present without disease. In a known tuberculous patient the intestinal lesion is most likely tuberculous. Clinical examination may be negative, although occasionally there is some muscle spasm in the right lower quadrant. Eighty to 90 per cent of tuberculous lesions are found in the ileocaecal region and admit a comparatively easy diagnosis by X-ray. In a series of autopsies at Saranac Lake in which active or healed intestinal tuberculous lesions were found, 95 per cent were in the ileocaecum or ascending colon. Detection of lesions in the small intestine is more difficult and the presence of symptoms aids materially in making a diagnosis. Efforts to detect increased rapidity of movement of the barium meal through the small intestine have been without results. Decreased rapidity of movement is apparent and more noticeable in the distal portion of the ileum. Here the change consists of localized persistent segmentation and dilatation from which the diagnosis of ulceration is inferred. Although these findings are substantiated by autopsy studies, they are not infallible because other conditions, such as adhesions, angulation, pressure or obstruction, may cause delay in the small bowel. Occasionally the terminal segment of the ileum is filled during the administration of a barium enema and, when diseased, presents evidence of irregularity and overactivity similar to that noted in the caecum. The diagnosis of ulceration in the small intestine is increasingly difficult as the site of the lesion recedes from the ileocaecal sphincter. The presence of disease in the caecum makes the presence of disease in the ileum more probable and perhaps justifies the diagnosis of ileal tuberculosis on only suggestive evidence. In the large intestine, the mechanism is essentially the same. The spastic contraction of the ulcerated area manifests itself in the spastic filling-

defect and loss of the normal haustrations. As healing progresses the ragged outline accompanying the spastic filling-defect gradually becomes smooth and as disease in the deeper layers of the intestine improves the haustration reappears. Treatment consists of exposure to ultraviolet rays, and the methods used in diagnosis are employed to determine the usefulness and results of the treatment. No special type of apparatus as a source of ultraviolet rays is used. It has not been necessary to exclude any form of pulmonary tuberculosis in which there was any chance of improvement. A number of patients suffered from haemoptysis at the beginning but, later, treatment was resumed without untoward results. The exact method is not considered of importance so long as the patient receives sufficient exposure and is not burned. No attempt is made to prevent tanning. Evaluation of any form of treatment is uncertain, for in many instances in which the primary pulmonary tuberculosis has caused the death of the patient the secondary intestinal lesions have shown marked tendency toward arrest and even complete healing. Eight per cent of 1,801 patients examined showed the presence of intestinal ulceration. Of 291 patients having intestinal tuberculosis, 271 received artificial heliotherapy and 20 did not. Of those receiving light, 198, or 73 per cent, are alive. Only 40 per cent of the untreated cases are alive. Four of these had excision of the tuberculous area of the intestine and 3 are dead. The 12 who received no artificial heliotherapy died within one year. At least 50 per cent of those treated lived from 2 to 6 years. Symptoms improved, slightly to markedly, in 45 per cent of the patients living and in 41 per cent of those who died. It was noted that a period of 8 to 10 months elapsed between the disappearance of symptoms and the return of the intestine to normal appearance. A total of 103 patients, 88 living and 15 dead, showed such normal films. In 120 patients showing symptomatic improvement, the intestine of 36 of the 64 living patients had become normal by X-ray, in 29 it was improved and 3 showed no change. Figures for the dead group are: 12, 9 and 4. Autopsy findings on 300 cases of pulmonary tuberculosis showed 229 to have some evidence of intestinal tuberculosis of which 67 showed signs of healing and 24 were completely healed. Fourteen of the 18 patients subjected to surgical treatment died.—*The Diagnosis and Treatment of Secondary Intestinal Tuberculosis, L. Brown & H. L. Sampson, British Journ. Phys. Med., August, 1933, viii, 58.*—(*L. F. B.*)

Ileocaecal Tuberculosis.—Studies with the single and double contrast enema afford an easier, quicker, less expensive and more reliable method for the diagnosis of early ileocaecal tuberculosis than the mouth-meal method. An analysis of 102 consecutive cases of pulmonary tuberculosis with tubercle bacilli in the sputum was made. Because the enema studies reveal these signs with greater diagnostic accuracy than the mouth meal studies in these early cases, its routine use is found more practical and satisfactory. The mouth-meal method was found to have its greatest usefulness as a supplementary examination in those cases with intestinal symptoms and negative enema findings, when lesions were confined to the jejunum and ileum.—*Ileocecal Tuberculosis and the Double Contrast Enema Examination, Jacob Gershon-Cohen, Am. J. Roentgenol. & Rad. Ther., December, 1933, xxx, 779.*—(*E. R. L.*)

Intussusception and Tuberculosis.—A man, aged 32, was operated upon for an intussusception of the ileum, 12 inches above the ileocaecal junction. The patient showed poor resistance to the operation, healing was unsatisfactory, and death occurred ten weeks after operation. Autopsy showed bilateral pulmonary tuberculosis, with a single tuberculous ulcer in the intestine located in the caecum. There was no local lesion to account for the intussusception. However, the absorption of fat from the mesentery, presumably due to the existing tuberculosis, resulted in a laxity of the tissues and probably predisposed to the intussusception.—*Intussusception Associated with Tuberculosis, E. R. Easton, Arch. Surg., 1933, xxvii, 868.*—(*R. D.*)

Tuberculosis of Thyroid.—About 255 cases of tuberculosis of the thyroid gland have been reported in the medical literature. Approximately one-half have been found postmortem, and the other half at operation where involvement of the thyroid with tuberculosis was present in about 0.1 per cent of the glands removed. With the exception of a moderate degree of hyperthyroidism, signs or symptoms diagnostic of this condition have not been established. A case is reported of caseous tuberculosis of the thyroid occurring in a child of three. At autopsy the additional interesting findings of a tuberculoma of the epicardium and of a solitary tuberculoma of the brain without meningitis were discovered. The clinical history of the case was that of a healthy child until the second year of life when the patient developed convulsions. These recurred at increasingly frequent intervals throughout the remainder of life. Ten days before admission to the hospital he began to run high fever, and signs of upper respiratory

and pulmonary infection appeared. When first seen he was found to be acutely ill with hyperpyrexia and signs pointing to involvement of the left lower lobe. A small mass, one and half by one inch, was present in the region of the left lobe of the thyroid. His course in the hospital was progressively downhill. There was sustained high fever, with signs of a spreading pulmonary process, and terminally convulsions occurred. The mass in the thyroid enlarged until it measured 3 by 2 inches. The tuberculin reaction was positive and tubercle bacilli were found in the sputum. The patient died six weeks after onset of acute symptoms. At autopsy the mass in the thyroid was found to be made up of caseous material with only a small portion of tissue, 1 cm. in diameter, present, resembling normal thyroid tissue. Cross-sections taken through this area revealed the fact that the normal tissue of the gland had in large measure been destroyed, with replacement of this in part by caseation necrosis, and in part by lymphocytes and endothelial cells. The junctional thyroid tissue bordering on this necrotic area was quite normal in appearance.—*Tuberculosis of the Thyroid Gland with Report of a Case in a Child Aged Three, L. M. Lindsay & C. I. Mead, Can. Med. Ass. J., 1934, xxx, 373.—(V. T.)*

Spinal Tuberculosis.—The curative effect of bony ankylosis is axiomatic in orthopaedic surgery. Nonoperative measures in general are not efficient in absolute spinal immobilization. Internal immobilization by means of an autogenous bone graft is the procedure of choice. Fusion of the spinous processes supplies an insufficient amount of bone and that supplied is extremely low in osteogenic potentiality. Vertebral bone is derived from ectoderm which because of its higher differentiation has little reparative ability. Autogenous bone-grafting was chosen from the tibia because of its high osteogenesis and because a long bone splint offered immediate immobilization. The tibia when inlaid into the spinous processes not only acts as a splint but fuses quickly and also acts as a vascular-conducting scaffold from each spinous process to the next. Promotion or stimulation of vascularization is an important consideration. Anatomically, vertebrae move through an anterior-posterior excursion over the widely separated articular processes as an axis. A broad fulcrum is afforded at the lateral facets. Bone grafts are placed posterior to this fulcrum and tend to hold together these processes which act as posterior arms of the lever. Thus eroding pressure from the vertebral bodies is prevented. The operation requires comparatively little time and produces little shock. A patient whose general condition would permit any major operation should stand a bone-grafting one. Fever due to the tuberculous process is not a contraindication but does act as one if due to pyogenic organisms. Tuberculous lesions elsewhere in the body do not necessarily act as contraindications, nor do draining sinuses, nor youth. Operative treatment is decidedly indicated in tuberculosis of the spine.—*Anatomico-physiological Considerations in the Treatment of Tuberculosis of the Spine, F. H. Albee, Am. J. Surg., August, 1933, xii, 204.—(J. F. B.)*

Results from Spinal Fusion.—It has been possible to inquire into the present condition of 84 out of 93 patients upon whom spinal fusion operations had been done between July, 1925, and July, 1931. Of the 93 patients, 49 were male and 44 female. Of 96 operations performed, 62 were of the Hibbs type, 24 of the Albee, and 10 a combination of the two. There was a history of contact with tuberculosis in 20 cases and 39 patients had tuberculous lesions elsewhere. Nine patients gave evidence of transverse myelitis. From the group of 84 patients, 58 show a good result, 2 fair results, 16 poor results including 7 in whom death was directly attributable to operation, and 8 are dead. Of 18 patients in the first decade of life, 13 show good results, 3 poor results and 2 dead. Twenty in the second decade show: 15 with good results, 2 poor, and 3 dead. In the third decade, 22 patients show: 14 with good results, 3 poor and 5 dead. Thirteen patients in the fourth decade show: 11 good, 1 fair and 1 dead. Of 11 patients over 40 years old, 5 show good results, 1 fair, 1 poor, and 4 dead. In the group with preoperative neurological complications, 1 is dead and 8 are subjectively cured although 2 retain a mild spastic weakness. The stability of a kyphos depends upon adequate anterior vertebral-body contact, and correction of the kyphos by abduction produces a dead space in the diseased area. Posterior spine fusion does not add sufficient stability to maintain the correction obtained in this manner. The good results found in children from 1 to 10 years old indicate the operation to be safe and effective in this age-group.—*The Results of Operative Fixation of Tuberculous Spines, D. King, Jour. Bone & Joint Surg., October, 1933, xv, 953.—(L. F. B.)*

Spinal Fusion in Childhood.—Although spinal fusion for tuberculous spondylitis has been practised for over twenty years there is still no unanimity in regard to its indications or therapeutic value. This study

is an analysis of cases treated both conservatively and surgically. Because an attempt was made to select cases of greatest similarity as to location and extent of disease as well as age of the patient, only a limited group can be reported. Of 40 selected cases, 12 were treated conservatively and 28 were operated upon. Of the 12 conservatively treated cases, 5 died and 7 are still under treatment. Of the 7 remaining, 2 are in very good condition and considered healed, 5 in good condition showing manifestations of healing. Four of the group show marked kyphosis. The surgical group may be divided into two; those operated upon early, in the first year, and those operated upon late, an average of 4 years after onset and following conservative treatment. Of the 9 early cases, 2 died over 1 year postoperatively, and one shows an excellent result. The remaining 6 cases show an increase in deformity. From the 19 late surgical cases, 12 have been discharged, and 7 remain under treatment. Of the 7, one is utterly hopeless, 2 show good results and 4 are too recent to classify. Although the conservatively treated group is small it shows that tuberculous spondylitis may be healed in childhood without surgical intervention, the average stay in a sanatorium being 4 years. It appears that early operation does not prevent deformity or shorten to any extent the healing period. The disease appears to run its course in spite of operation. Spinal fusion in late cases, in which the disease is on the way to healing or is already healed, contributes considerably to the stabilization of the defective spine, especially in the lumbar region, and gives some assurance of maintaining the results already reached.—*Contribution to the Question of Spinal Fusion in Tuberculous Spondylitis in Childhood, E. Freund, Jour. Bone & Joint Surg., July, 1933, xv, 752.*—(*L. F. B.*)

Hip-Fusion Operation.—The operative fusion for hip-joint disease, especially tuberculosis, is becoming the treatment of choice. The procedure described combines features found in intraärticular and extraärticular types of fusion operations. The greater trochanter, femoral neck and superior margins of the hip-joint are exposed by a straight lateral incision over the greater trochanter, extending from the crest of the ilium to the juncture of the upper and middle thirds of the thigh. Two heavy osteoperiostal flaps are reflected from the anterolateral and posterolateral aspects of the greater trochanter and shaft of the femur. A massive graft including the greater trochanter, lateral surface of the neck and a portion of the cortex of the shaft is removed by converging cuts. The cartilage of the head of the femur and of the acetabulum is replaced by cancellous bone-chips. The trochanteric graft is turned end for end and the shaft driven firmly into a recess that has been made on the lateral surface of the ilium. The thigh is abducted and the osteoperiosteal grafts are sutured firmly over the free end of the trochanteric graft. The wound is closed without drainage and a double plaster spica applied.—*Hip Fusion Operation, F. A. Chandler, Jour. Bone & Joint Surg., October, 1933, xv, 947.*—(*L. F. B.*)

Bone Graft in Tuberculosis of Hip.—Sufficient time has elapsed to evaluate the advisability of extraärticular bone-graft treatment of tuberculosis of the hip. It is believed that a certain number of failures will occur regardless of the type of the operation. The present study is based upon 50 cases with extraärticular bone-graft. There was no operative mortality in this group and a distinct improvement in the physical condition was noted following operation. Sinuses were present in 6 patients preoperatively and in 3 after operation: three healed. The average age of the patients was 7 years with an average duration of disease of 4.3 years. The patients walked at an average of 1 year and 4 months after operation. Twenty patients required more than one operation before obtaining a successful result and in general these patients were younger than those in the group requiring only one operation. The duration of disease before operation was longer in the group requiring one operation. In cases of long-standing disease there was a shorter distance from trochanter to ilium and less joint mobility. Primary successful results were more frequent in these. The presence of a sinus or abscess did not hinder the possibility of primary success. No advantage of the pedicle iliac graft over the free iliac graft was found. Removal of cartilage from the trochanter was of no special advantage and the application of a double hip spica did not prevent failures. Failure of the primary operation was found in the early acute cases with little destruction of the head of the femur or acetabulum and considerable free motion of the joint.—*Extraarticular Bone Graft Treatment for Tuberculosis of the Hip Joint, S. L. Haas, Jour. Bone and Joint Surg., July, 1933, xv, 743.*—(*L. F. B.*)

Tuberculosis of Trochanter.—The authors present a study of 19 patients with tuberculosis of the greater trochanter and the trochanteric bursa beneath the gluteus maximus, verified by operation, pathological examination, and in five cases, guinea-pig inoculation. Evidence of tuberculous dis-

ease in other parts of the body was found in 73 per cent of the cases, 42 per cent of which was in the lungs and 31 per cent in other parts of the body. The symptoms were usually local and consisted of a cold, fluctuating swelling, local tenderness and, seldom, impairment of motion of the joints. Roentgenograms showed involvement of the trochanter in 78 per cent of the cases. The treatment advocated was early radical excision of the involved area, followed by adequate antituberculosis measures, such as rest, proper diet, codliver oil, and heliotherapy, with special stress on the last-mentioned. The prognosis is good with prolonged careful general treatment. Without treatment, sinuses form and spread infection into the neck of the femur and hip joint.—*Tuberculosis of the Greater Trochanter, H. W. Meyerding & R. J. Mroz, J. Am. M. Ass., October 21, 1933, ci, 1308.*—(*G. L. L.*)

Tuberculosis of Knee-Joint.—A comparison is made between the roentgenogram and the gross and histological pathological specimens in 65 cases of tuberculosis and 11 cases of nontuberculous arthritis of the knee-joint. In a large percentage of cases the roentgenograms accurately demonstrate the existing pathological lesions, but, because of the similarity of the two processes, cannot be considered in most cases as dependable diagnostic evidence. The principal shortcoming of the roentgenogram is the failure to demonstrate the early pathological changes in bone or synovia and the presence of areas of sequestration. The principal advantage of the roentgenogram is the demonstration of lesions of the bone which may remain hidden beneath more superficial disease of the synovia or even beneath structures that appear to be perfectly normal.—*Tuberculosis of the Knee Joint. A Comparison of Its Morbid Anatomy with Its Roentgenologic Manifestations, R. K. Ghormley, B. R. Kirklin and E. A. Brav, Am. J. Roentgenol. & Rad. Ther., December, 1933, xxx, 747.*—(*E. R. L.*)

Subchondral Granulation Tissue in Tuberculosis of Knee.—Tuberculosis of the knee may occur primarily either in bone or synovial membrane. The original lesion in the bone may become encysted and localized or may infiltrate the surrounding tissue, advancing to the articular cartilage or to the synovial membrane at its point of reflection from the bone. In the process of invasion diffuse granulation tissue is formed which produces a uniform atrophy of the surrounding bone. If caseation occurs, gross abscesses may form in the bone or synovial membrane. When the synovial tissue is involved, the disease advances through the synovial substance, and a tuberculous pannus grows across the articular surface from the synovial reflection, eroding the cartilage from above. The bone is invaded at the margin of the joint and the pannus may progress to the deeper bony tissue. A thin layer of granulation tissue is formed at the synovial margin which progresses between the cartilage and bone toward the centre of the joint eroding the adjacent structures. Microscopic sections from ninety-one knee-joints were studied. The subchondral granulation tissue was distinctly tuberculous in eleven; it could not be definitely demonstrated in fifty-three because of complete destruction of the cartilage. In twenty-seven, conclusive evidence of tuberculosis was lacking, although the synovial membrane of each was definitely tuberculous. In the earliest lesions, of two or three months' duration, evidence of disease was found in both the synovial membrane and the adjacent bone, demonstrating the futility of conservative surgical procedures. There seemed to be no consistent relationship between the site of cartilage destruction and the region of maximum growth of subchondral granulation tissue. The subchondral granulation tissue seemed to bear no relationship to the marginal pannus formation, and in the majority of the sections a more extensive encroachment of the centres of the joint by it than by pannus was demonstrated. The subchondral granulation tissue appears to be a response to actual infection, and the amount of tissue growth is proportional to the amount of infection, but it has no apparent direct relationship to the duration of the disease.—*Subchondral Granulation Tissue in Tuberculosis of the Knee Joint, E. A. Brav, Jour. Bone & Joint Surg., July, 1933, xv, 631.*—(*L. F. B.*)

Associated Pulmonary and Bone Tuberculosis.—The variance in the statistics of associated pulmonary and bone and joint tuberculosis may be due to the fact that the figures were compiled from cases of clinically diagnosed but not proved tuberculosis. Of 164 consecutive patients clinically diagnosed as having bone or joint tuberculosis, 100 were found, after careful laboratory study, to have positive pathological reports. Fourteen cases were negative and in 50 there were no pathological reports because of location of lesion, severity of the disease or failure to secure specimens. Of the 100 proved cases, 27 gave evidence of parenchymal or adult pulmonary tuberculosis and 13 of active childhood tuberculosis. Of 41 children, 1 to 15 years inclusive, 8 had parenchymal

lesions and 10 had childhood-type tuberculosis. In 59 cases, 16 years or over, there were 19 with parenchymal lesions and 3 with childhood type. Of 37 adults alone, 15 had pulmonary lesions. Renal tuberculosis was found in 8 per cent of the cases, 4 of the cases being bilateral; tuberculous epididymitis in 6 per cent, tuberculous tonsils in 5 per cent and 14 per cent had single tuberculous lesions. In 44 cases tested with tuberculin, by the Mantoux method, 42 reactions were positive. Tuberculoprotein ultrafiltrate or tuberculoprotein trichloracetic ga ve the best results. Of the 27 cases of parenchymal tuberculosis, history of contact was not known in 12, and was positive in 13 and negative in 2. In the summary of the 100 cases, 89 were white, 7 colored, and 4 Indian. It should be stressed that bone and joint tuberculosis is a systemic disease and that positive diagnosis is essential to correct treatment and accurate interpretation of results.—*The Association of Pulmonary and Other Tuberculous Lesions in Cases of Bone and Joint Tuberculosis, C. H. Snyder, Jour. Bone & Joint Surg., October, 1933, xv, 924.*—(*L. F. B.*)

Treatment of Bone Tuberculosis.—On reviewing a series of cases of extrapulmonary tuberculosis it was found that 55 per cent had multiple lesions, and in 85 per cent of the cases active pulmonary disease was found. Adequate treatment of bone tuberculosis should begin with such general hygienic measures as bed-rest, good food, fresh air and heliotherapy. In a series of cases treated entirely without surgery the average hospital stay was 1,115 days with recurrence or reactivation in 20 per cent within two years. A series treated surgically without preliminary observation was admitted with reactivation, new lesions and slipping bone grafts and required longer periods of hospital care than did similar cases treated with a preliminary period of general therapy. In a series treated by general therapy followed by surgery, the hospital stay was 682 days with 2 per cent showing recurrence or reactivation after two years. Bone tuberculosis is a general disease and since our object is to shorten the period of disability as much as possible and give some assurance against reactivation, the treatment should be directed to improving the general condition of the patient until ability to combat the disease and quiescence of the disease are demonstrated before resorting to surgery.—*The Rational Treatment of Bone Tuberculosis, C. K. Petter, Jour. Bone & Joint Surg., October, 1933, xv, 986.*—(*L. F. B.*)

Light Baths in Surgical Tuberculosis.—The theory of varying stimuli and varying responses endeavors to afford some explanation of the variation in the results of light treatment. The sun will not cure all forms of surgical tuberculosis and it is quite possible to cure any form of surgical tuberculosis without light treatment. It is an aid and accelerator of cure and should supplement other methods. A reasonable explanation as to the value of the light bath has not been offered by scientific investigation on the demonstrable effects of ultraviolet and other form of light. A study of the success or failure following light treatment should consider the combined effects of the different reactions. A nude body exposed in the open air is subject to conditions that undergo seasonal, daily and hourly variation. Geographical location and climate also vary the conditions. There is an individual variation in patients producing both a daily and seasonal response to treatment. The greatest seasonal response occurs in the spring and early summer, gradually decreasing after about July. In practice the response can again be accelerated by transferring the patient to a different district at this time or altering the character of the light. Faster beneficial results are obtained by alterations of light and shade, of heat and cold, and of humid and dry air. Depending on the individual power of response to light stimuli it appears that the benefits may be ascribed not so much to the intensity of the light as to the shock-varying stimuli. The beneficial effects of early morning light which is often of low ultraviolet value, may be due solely to the light shock evoking a greater response immediately following the darkness. The increased basal metabolism of some patients is due to cold and not the light. It is very beneficial when not carried beyond the patient's ability to withstand it. The general bath is a powerful tonic and stimulant but an excess of light will not necessarily produce a corresponding improvement. A knowledge of the nature of the light used and the effects it will produce is necessary but the proper exposure of a patient to light is gained by the estimated power of response judged by clinical experience. The correct clinical estimate of the total effect produced is of greater value in treatment than exact information as to certain reactions. Heliotherapy is still more an art than an exact science.—*General Light Baths in Surgical Tuberculosis, H. Gauvain, Brit. Jour. Phys. Med., 1933, viii, 19.*—(*L. F. B.*)

Tuberculous Bursitis.—Investigation of the literature of recent years, including

standard orthopaedic text-books, reveals tuberculous disease of a bursa which does not involve the adjacent joint to be rather rare. Previous reports do not contain both X-ray findings and microscopical pathology. The following case is reported: An 11-year-old white male complained of swelling in the knee five months after an injury. The immediate pain lasted about one week but the swelling persisted. Six weeks after the injury sterile bloody fluid containing a few bits of flaky material was aspirated. After 5 weeks in a plaster cast, the knee was bandaged, and baking and massage treatments were instituted. Examination showed considerable fluid in the suprapatellar bursa with some thickening about the joint, the patella freely movable, and the range of motion complete and painless. X-ray examination showed no bone involvement. Three weeks later an exploration of the bursa was made. Fifty to sixty cubic centimetres of serosanguineous fluid with numerous chunks of fibrin were removed. The bursa was very extensive and there was no communication with the knee joint. No organisms were cultured from the fluid removed and the inoculated guinea pig was accidently destroyed without examination. Microscopical examination of tissue removed from the sac showed numerous giant cells surrounded by a large number of epithelioid cells, lymphocytic infiltration and definite tubercle formation with several areas of caseation necrosis.—*Tuberculous Bursitis without Adjacent Joint Involvement Following Trauma, W. J. Stewart, Bone & Joint Surg., July, 1933, xv, 626.*—(*L. F. B.*)

Arthrodoesis of Shoulder.—Although there is extensive bone destruction in tuberculosis of the shoulder joint there is relatively little caseation and abscess or sinus formation. Secondary pyogenic infection is uncommon and bony ankylosis is rare. The usually accepted duration of the disease is from three to five years, since, by conservative methods, the arm must be held in position long enough to establish a sufficiently strong fibrous ankylosis to maintain the best functional position. The following operation was performed on three cases, after conservative treatment had produced quiescence of the disease, with resulting bony ankylosis, no aggravation of symptoms and no recurrence of the disease elsewhere: The upper three inches of the humerus, the outer third of the clavicle, the acromioclavicular joint and outer third of the spine of the scapula were exposed through a straight incision over the point of the shoulder. The deltoid was separated subperiosteally from its origin. The upper and lower surfaces of the acromion process were freshened and made raw by removing the cortical layer of bone. A broad flap of bone was raised, but not completely fractured, from the outer surface of the humerus immediately beyond the capsular attachment. The clavicle and spine of the scapula were partly fractured a short distance from the outer end. With the arm abducted the whole acromioclavicular mass was angulated down and wedged beneath the bone flap raised from the humerus. Fixation was augmented by a few strong sutures. A plaster spica was applied with the arm in a position of 80 degrees abduction, 30 degrees forward flexion and 30 degrees external rotation. A second close-fitting plaster spica was applied two weeks postoperatively and allowed to remain 4 months. If X-ray examination showed bony fusion, an abduction frame was applied. When the muscles of the patient became strong enough to hold the arm in abduction the frame was gradually discarded.—*Extra-articular Arthrodoesis of the Shoulder, R. W. Jones, Jour. of Bone & Joint Surgery, October, 1933, xv, 862.*—(*L. F. B.*)

Cortical Extract in Addison's Disease.—A woman, aged 45, complained of exhaustion and dyspepsia. Her pulse was 80 and her blood-pressure was 88/40. The lungs, abdominal organs and nervous system were apparently normal. There was bronze discoloration of the forehead, chest, axillae, groins, arms and abdomen. Adrenalin alone was of some value in controlling symptoms, but combined with whole adrenal-gland capsules it was more effective. Improvement was marked and rapid, following daily and later twice weekly injections of eucortone with in addition 10 grains daily of whole adrenal gland. The systolic blood-pressure rose to 120, and the patient could walk a mile without undue fatigue. Pigmentation became less marked and digestive troubles diminished. A second patient, a woman, aged 35, complained of weakness and pain in the back and left loin. Though there was a history of tubercle in childhood there were no signs of tuberculosis in the lungs or abdomen, and the urine was negative. There was some dyspepsia and the patient had lost weight. She had fainted twice on the street. The systolic blood-pressure was 120. After 19 days pigmentation was found on her neck, and discoloration was noted in the axillae and groins. Jet-black freckles were found on the arms and forearms. Improvement began on daily injections of 2 cc. of eucortone. The temperature, previously subnormal, rose to normal. The pains ceased and pigmentation almost disappeared. These two cases illustrate the definite effect of cortical

extract in relieving symptoms of Addison's disease, except for hypotension, which is improved by adrenalin. Whole gland was given in addition to the eucortone, because some observers believe that there may be a third hormone. The possibility of underlying tuberculosis must not be lost sight of in treatment, since three-fifths of the cases of Addison's disease are due to tuberculous invasion of the adrenal gland.—*Two Cases of Addison's Disease Treated by Cortical Extract, A. Charpentier, Lancet, October 21, 1933, ccxxv, 921.*—(*E. H. K.*)

Urography in Renal Tuberculosis.—To answer the question of how far excretory urography can be relied upon in the diagnosis and localization of renal tuberculosis, it can be said that as a rule renal tuberculosis will cause some degree of deformity in the excretory urogram. Although the abnormality may not be typical, nevertheless, with the aid of other confirmatory evidence, a diagnosis frequently can be established. When any of the following signs are observed in the excretory urogram, namely, absence of or marked delay in visualization, irregular pyelectasis or ureterectasis, failure of visualization of one or more calices, with irregularity of the pelves, or definite necrosis on one side and a normal pelvis and ureter on the other, the diagnosis of renal tuberculosis often can be inferred. Normal visualization on one or both sides would not necessarily exclude renal tuberculosis. Although it is usually advisable to corroborate the urographic evidence of a normal kidney on the opposite side by means of ureteral catheterization, nevertheless, if for any reason cystoscopy would be difficult or impossible, a physician could with some assurance advise removal of the kidney involved.—*The Practical Application of Excretory (Intravenous) Urography, W. F. Braasch, J. Am. M. Ass., December 9, 1933, ci, 1848.*—(*G. L. L.*)

Actinotherapy in Urogenital Tuberculosis.—From a study of 242 cases of urogenital tuberculosis treated at the Necker Hospital for Urinary Diseases during the past three years the following results can be published: There were 46 cases of postnephrectomy sinuses and cystitis with 25 cures, 20 improved and one failure; 14 cases of bilateral renal tuberculosis with 12 considerably improved and 2 failures; 105 cases of tuberculous epididymitis without sinuses with 68 cures, 30 improved and 7 failures; 70 cases of postepididymitic sinuses with 52 cures and 18 improved; 7 cases of lumbar sinuses, postnephrectomy or postnephrotomy with 7 cures. Actinotherapy was used as an adjuvant to other treatment. These results were obtained by using polymetallic arcs, the radiations from which comprise not only ultraviolet rays but also a considerable portion of the visible and infrared rays. The light was centered some 20 cm. from the principal lesion and the initial exposure of 5 to 7 minutes was given. Subsequent exposures were gradually increased to 15 and 20 minutes. In treating renal tuberculosis the initial exposure was one-third the first-degree erythema dose, the subsequent exposures being increased by one-half minute up to six minutes. In orchiepididymitis, 2 or 3 times, the first degree erythema dose can be given at the initial exposure.—*Actinotherapy in Urogenital Tuberculosis, A. Legueu, J. Saidman and S. Avram, Brit. Jour. Phys. Med., May, 1933, viii, 6.*—(*L. F. B.*)

Tuberculous Meningitis.—Twenty-nine cases of tuberculous meningitis occurring in adults between the ages of 15 and 50 are reported. All were fatal. The predominating early symptoms were headache, vomiting, backache, constipation, and pyrexia. The duration of illness was reasonably certain in 20 cases and averaged fourteen and a half days. The temperature was usually irregular, ranging between 97°F. and 101°F.: in 12 cases it never rose beyond 100°. Pain in the neck, including pain in the nape of the neck at rest, pain on passive motion, or resistance to flexion and extension of the head was noted in 18 cases. Inequality of the pupils, dilatation of both pupils, or loss of the light reaction was noted in 18 cases. Pyramidal-tract signs, including spasticity of the limbs, increased tendon jerks, ankle clonus, Kernig's sign, and an extensor plantar response were sometimes slight when the case was bacteriologically positive. In all but 5 cases some alteration of mentality or behavior occurred. The fluid obtained by lumbar puncture was examined in 23 cases and tubercle bacilli were found in 22. In these the fluid-pressure was noted as being increased in 5 and much increased in 7. In this series 18 of the 29 cases showed no other clinical focus of tuberculosis. The clinical diagnosis of meningitis was rarely possible before the tenth day.—*Tuberculous Meningitis in Adults, A. H. Holmes, Lancet, September 16, 1933, ccxxv, 635.*—(*R. D.*)

X-ray Therapy in Tuberculous Meningitis.—In 1932, von Bokay reported the recovery of 5 cases of tuberculous meningitis among 17 that were given X-ray therapy to the cranium. The author treated 15 cases in the same way. Not only did recovery fail to occur in any case, but the number of bacilli in the spinal fluid was usually increased after

X-ray treatment, and in many cases the symptoms seemed to be aggravated.—*La roentgenothérapie de la meningite tuberculeuse chez l'enfant, T. Mogilnicki, Rév. franc. péd., 1933, ix, 652.—(M. D.)*

Treatment of Lupus by Artificial Sunlight.—A water-cooled arc-light that reproduces the solar spectrum as far as 2900 A. U., with an intensity of 120,000 Hefner lamps to the square centimetre, is used for the treatment of lupus of the mucous membrane. For lesions of the lip, cheeks, tongue and soft palate the light is applied directly. The larynx is irradiated indirectly or directly in suitable cases. Since 1921, some 1,000 cases have been treated. One-half the cases showed marked diminution of pain regardless of influence upon the lesion. About one-third of the cases resulted in local cure; one-third showed incomplete healing; and one-third showed no improvement. Successful light treatment presupposes a responsive system in which other foci of disease are latent or at least retrogressing. The curative effect of light is purely local and it has not been possible to formulate any law regarding blood changes induced by irradiation. Duration of the healing period is shortest with lesions of the lip, cheek and tongue, longer with lesions of the hard palate and larynx, and longest on the gums. The effect of light on the tissues can be intensified by sensitization of the patient by an intravenous injection of 2 or 3 cc. of trypaflavin.—*Treatment of Lupus of the Mucous Membrane by Artificial Sunlight, E. Wessely, British Journ. Phys. Med., August, 1933, viii, 55.—(L. F. B.)*

Ambulatory Treatment of Lupus.—Four cases of long-standing and unsuccessfully treated cases of *lupus vulgaris* were apparently healed in a short time, using a combination of light, diathermy and diet. The lesion was carefully cleaned of scales and crusts with oil and ether. It was then "spark painted" until the patch gave the appearance of having been painted with a dilute solution of silver nitrate. Special attention was given to the margins of the lesion and deep seated nodules. No anaesthetic was necessary. The first exposure to the Sollux lamp was given immediately following the diathermy treatment, and lasted half an hour. Subsequently the exposures were for one hour and given on days alternating with the diathermy treatments. The lamp was placed at the shortest distance that could be painlessly borne by the patient. Following treatment, the affected part became a flaming red color. It was bandaged and a neutral ointment applied. The diet prescribed was rich in vitamines and poor in animal albumen. Two vigantol, irradiated ergosterol, tablets and nine one-gram calcium tablets were prescribed. This method of treatment was successful, short, inexpensive and the patients remained ambulatory during its course.—*Ambulatory Treatment of Lupus by Light, Diathermy and Diet, S. C. Dalsgaard, British Journ. Phys. Med., August, 1933, viii, 56.—(L. F. B.)*

Acute Lupus Erythematosus.—Acute lupus erythematosus differs from the chronic type in the rarity of its incidence, in its symptomatology and in its prognosis. At onset the skin lesions are not striking, and constitutional symptoms predominate. The course of the acute illness is one of repeated exacerbations of increasing severity, with death the usual termination as a result of some fatal complication. Recoveries are very rare, but occasionally the acute form may pass over into the chronic type. The onset of a typical acute lupus erythematosus is marked by the constitutional findings of chills and fever, and by muscular and articular pains in many instances. The skin lesions appear first on the face as small discrete red infiltrated areas, rapidly enlarging and becoming confluent. The skin of the face becomes red and oedematous, and at this stage the lesions can at times be differentiated from those of erysipelas only by the symmetry of their distribution, and by the absence of a sharp limiting margin. The eruption may remain unchanged for weeks or months, or may disappear rapidly. The temperature curve is either remittent or sustained, but with the fading of the eruption it approaches the normal, or may even be at a subnormal level. With each succeeding exacerbation the skin lesions become more pronounced. They extend to the extremities, appearing as small, round, red and later bluish areas resembling exudative erythema multiforme. Then the skin on the trunk becomes involved, at first with wheal-like lesions, the wheals later becoming nodular. The mucous membranes of the mouth may become oedematous and hyperaemic with the development of small haemorrhages and even abscesses. Finally the eruption may come to resemble morbilli or typhus, or small haemorrhages may present the picture of toxic purpura. The lesions on the trunk clear centrifugally leaving a faint marginal pigmentation. Those of the face, hands and feet leave more marked scarring with true pigmentation about the nodule, the nodule itself remaining unpigmented. Each exacerbation flares the former lesions, and is accompanied by a recurrence of chills and fever. Swelling of the regional lymph nodes occurs

during the active phase of the disease cycle. Exacerbations may appear weeks or months apart, but sooner or later a secondary complication terminates the disease. All five patients reported in this study died. Pulmonary complications mark the greater number of cases. Bronchopneumonia, or, more rarely, lobar pneumonia develops toward the end of an acute phase. The pleura is involved in many cases with the collection of large pleural effusions, sterile on culture and on animal inoculation. Fresh tuberculous lesions have not been demonstrated in the lungs or elsewhere in the body. The presence of older tuberculous lesions which may be present does not justify the conclusion that the tubercle bacillus is responsible for this disease. Renal are secondary to pulmonary complications in importance. A focal nephritis may be present from onset, or there may be a diffuse glomerulonephritis with gross haematuria and nitrogen retention. Cardiac involvement, myocarditis, endocarditis and pericarditis are not uncommon. Agonal positive blood-cultures are found, but in addition a true bacteraemia may occur, with the formation of metastatic abscesses and bacilluria. The gastrointestinal system escapes for the most part, although terminally there may be evidence of liver damage in the appearance of icterus, nausea and vomiting. The blood-picture is extremely variable, and data on the fluctuations during different phases of the disease are inadequate. The red blood cells may be reduced. The total white count varies from a true leucopoenia under 1,000 cells to a leucocytosis of 20,000 to 30,000. There may also be a thrombopenia. Not only a relative lymphocytosis may be present, but an absolute increase in lymphocytes usually occurs. The skin may show variable degrees of pigmentation, at times sufficient to suggest the diagnosis of Addison's Disease. A discussion of the aetiology of the disease lies without the scope of the paper. However if lupus erythematosus is due to infection with the tubercle bacillus, then the organism is in a form heretofore not recognizable, with an action which is unknown on the tissues of the body, and whose presence can not be demonstrated by ordinary cultural methods or by known animal innoculations.—*Interne Krankheitsbilder beim Lupus erythematodes acutus, H. Wendt, München. med. Wchnschr., February 9, 1934, lxxxi, 217.*—(*V. T.*)

Erythema Nodosum.—Although the tuberculous aetiology of erythema nodosum is generally agreed upon, adequate bacteriological proof is wanting. The finding of acid-fast bacilli in the lesions has been reported by two observers, but in both cases there is doubt as to the accuracy of the diagnosis. In this preliminary communication the author reports the successful production of tuberculous lesions in guinea pigs by progressive inoculations of tissue from the nodules of erythema nodosum. He obtained this result in three out of five cases. Direct demonstration of acid-fast bacilli (by culture) was successful in only one of the five cases. The existence of an "ultravirus" of tuberculosis may explain the lack of concordance between bacteriological and experimental findings.—*Vérification expérimentale de l'étiologie tuberculeuse de l'érythème noueux, R. C. Aguirre, Arch Méd. Enf., 1933, xxxvi, 521.*—(*M. D.*)

Erythema Nodosum.—The author's observations on erythema nodosum in Stockholm extending over a period of many years comprises over 200 cases, mainly in children but including a fairly large number of adults. Investigation has been carried out along three lines: (1) tuberculin reaction, which is with few exceptions positive in all cases at some stage in the symptom-complex; (2) careful inquiry into family-history and investigation of immediate surroundings, revealing a source of tuberculous infection in a large number; (3) clinical and roentgenological study both during and after the occurrence of erythema nodosum, which indicates that the symptom complex is a part of early tuberculous infection, the primary focus being usually in the chest. As Wallgren has demonstrated (1927), erythema nodosum appears (in certain individuals) as a skin manifestation of the development of tuberculin allergy a few weeks after infection with tuberculosis. In some cases of tuberculous infection a certain alteration of the allergic condition after an acute infectious disease, notably measles, may produce erythema nodosum. Treatment in cases of erythema nodosum is directed against the underlying tuberculosis, and as this is usually at a very early stage of development, the prognosis is, as a rule, good.—*Erythema Nodosum and Tuberculosis, H. Ernberg, Am. J. Dis. Child., December, 1933, xlvi, 1297.*—(*M. D.*)

Erythema Nodosum.—Evidence is presented in support of the view that "erythema nodosum is a type of hyper-reactive tissue response to different bacterial allergens." The commonest allergen responsible for the disease is tuberculin, rarely the haemolytic streptococcal endotoxin. For a practical approach, every case should be regarded and treated as tuberculous until proved otherwise.—*Erythema Nodosum, W. R. F. Collis, Brit. M. J., December 23, 1933, no. 3807, 1162.*—(*T. O. R.*)

Conservatism in Treatment.—Surgery does not cure tuberculosis, nor is it a substitute for rest. No matter how brilliant the mechanical results of the surgical procedure, if the lesions are to heal, much time must be given by the patient to the proper regimen. The untrained patient is likely to get a false sense of security by the rapid subsidence of symptoms following collapse therapy. In no other disease is the problem of the assay of the results of treatment more difficult than in tuberculosis. Each case is a law unto itself, and control observations are practically impossible. Healing on a regimen of rest alone takes place often enough to justify fully a period of observation in the majority of cases in private practice. Hasty collapse therapy is unwise, because it is frequently needless. Those who claim good results by the use of collapse therapy in very early lesions perhaps forget that it is in these same early lesions that careful bed-rest and supervision achieve their most brilliant results. If after six months' observation, serial X-rays and clinical findings indicate the disease to be stationary or progressive, collapse therapy should, if possible, be undertaken. Artificial pneumothorax in suitable cases is the method of choice. Should this be impossible phrenicectomy may be done. Severing of adhesions is indicated in certain pneumothorax cases in which the cavity is held open by string-like adhesions. When all efforts fail in healing a unilateral lesion, and the patient is in good condition, apicolysis, tamponage, or thoracoplasty must be considered by the surgeon-internist team.—*Conservatism, the Keynote in the Treatment of Tuberculosis, C. H. Cocke, Ann. Int. Med., December, 1933, vii, 746.*—(*E. H. K.*)

After-Care Settlements.—By after-care settlement is understood the workshop settlements in contradistinction to the training-school intended for only a short after-cure of arrested cases and after-cure colonies where the patients are still in need of care. The expatient settlement admits a selected group of arrested, but not healed cases, who must earn a living and are no longer entitled to aid. The problem of making permanent cures leads to a division of the sanatoria into a clinical department for active therapy, a nursing department for hopeless cases, a sanatorium department for arrested short-cure patients, and a workshop or industrial settlement. This settlement is for moderately advanced cases offering hope of permanent cure whose prognosis is not yet clear and who cannot afford an unlimited stay in the hospital. It is also a village settlement for expatients and offers hygienic sheltered conditions for chronic or stationary hopeful open cases who are unwilling or unable to enter a hospital. The hospital at Breslau-Herrnprotsch comprises 300 beds and cares for men, women and children. During the last year an occupational-therapy section has been added. No wages or pocket money are paid. The after-cure settlement consists of two buildings for unmarried persons and 32 one-family houses. Board and rent for the unmarried, 60 women and 35 men, is paid by the municipality and insurance. From 10 to 20 R. M. a month is paid to each settler by the workshop. In the family houses, the patient has his room and bath on the second floor, a three room flat and kitchen being on the first. With small families, the second floor room is given over to an unmarried person while the sick member is provided for on the first floor. All married settlers receive tariff-wages paid in the form of coupons for food. No recurring symptoms of illness have been found in 50 children brought to the settlement. Children born in seriously ill families have shown lung infiltrations most of which were benign in nature. The workshops contain sewing, book-binding, cabinet-making equipment and a locksmith department for making steel furniture. The working time is four hours a day. Production and turnover as yet are small and sales are limited by local regulations. Selected patients from the hospital division are allowed to work in the shops without compensation. The hospital and after-care settlement belong together. The number of settlers will always be small because the majority of cases return to their old surroundings.—*After Care Settlements for Tuberculous, E. Brieger, Journ. State Med., December, 1933, xli, 735.*—(*L. F. B.*)

Indications for Collapse Therapy.—A conservative discussion of the indications for the various types of collapse therapy is advisable in view of recent tendencies to utilize mechanical aids in every case of unilateral tuberculosis. Physiological rest, with careful observation of the patient's progress by serial X-rays, fluoroscopic examinations, and studies of the sedimentation rate and leucocyte-lymphocyte ratio is indicated for a period of six months. Those patients who fail to improve or who suffer from haemoptyses or show extension of the disease process should be given the advantage of collapse therapy. The most useful procedure is artificial pneumothorax. An adherent pleura was present in 26 per cent of the cases in which this treatment was attempted. String-like adhesions can usually be stretched; in fact clear-cut indications for pneumolysis exist in not more than 3 per cent, and this figure can be reduced by

utilizing phrenicectomy to relax adhesions. In a series of 183 patients treated by phrenicectomy alone an arrest of the disease was obtained in 12 or 6.6 per cent. This series included some patients who were virtually in the terminal stage which was admittedly an error. Thoracoplasty should be utilized only in carefully selected cases, and if contralateral involvement is present it should have been inactive for a year. The procedure was used in 2.4 per cent of all patients, and in 4.6 per cent of unsuccessful pneumothorax cases, with an operative mortality of 12 per cent, which was reduced to 7 per cent in the last year. In 50 per cent there resulted apparent arrest or improvement to such an extent that full-time work could be done. Of the patients seen over a period of 13 years, pneumothorax was applicable in 15.67 per cent, phrenicectomy as an independent or supplementary procedure in 19 per cent, and thoracoplasty in 2.4 per cent.—*The Indications for Collapse Therapy in Pulmonary Tuberculosis, I. D. Bronfin, Ann. Int. Med., October, 1933, vii, 468.*—(*R. D.*)

Indications for Collapse Therapy.—Pneumothorax should not be given in the presence of very recent and destructive infiltrations because the danger of pleural rupture is great. It is better to keep the patient at absolute bed-rest until some fibrosis has replaced the infiltration and until the cavities show evidence of fibrosis. When obliterative adhesions are severed by intrapleural pneumolysis the visceral pleura becomes so much thickened that one may not expect reëxpansion of the lung. Pneumothorax should be maintained in such cases only if one is prepared to continue it indefinitely; otherwise extrapleural operations, such as phrenic nerve interruption or partial thoracoplasties, are preferable. It is useless to continue pneumothorax over a long period of time in the presence of stiff-walled cavities that are of the size of an apple or larger. In such cases pneumothorax should be considered only as a preliminary to thoracoplasty, partial thoracoplasties being frequently indicated. Partial thoracoplasties and paraffin fillings should be done only when total thoracoplasty is contraindicated. The usual indications for phrenic-nerve interruption are restated and recommended, but it is claimed that lesions of purely exudative or productive nature in the upper lobes contraindicate the operation because paralysis of the diaphragm is followed by increased respiratory motions in the upper part of the thoracic cage. In cirrhotic foci in the upper lobes, phrenicectomy yields beneficial results only if the interlobar fissures are obliterated so that the relaxation of the pulmonary tissue, produced by an elevated diaphragm, may be transmitted to the upper portions of the lung.—*Die Abgrenzung der Indikation zu den verschiedenen Methoden der Kollapstherapie, W. Kremer, Beitr. z. Klin. d. Tuberk., November, 1933, lxxxiii, 675.*—(*M. P.*)

Collapse Therapy in Early Lesions.—The author has for years advocated some form of collapse therapy in almost all patients with pulmonary tuberculosis as soon as active disease is discovered, unless contraindications exist. This advice has been opposed on the ground that many patients with minimal lesions make complete, permanent recoveries without any form of collapse, but it is impossible to predict the fate of patients with early minimal lesions under simple rest and hygienic treatment. Minimal lesions may break down into cavities, 4 or 5 cm. in diameter, in a few weeks. In patients with minimal lesions the proper use of collapse therapy may be expected to lead to recovery in almost all cases. Phrenicectomy is a simpler procedure than pneumothorax and accomplishes the desired result in many patients. Only in exceptional instances has the use of collapse therapy proved detrimental to the patient in after years. Temporary paralysis of the diaphragm from simple crushing of the phrenic nerve will be sufficient to allow healing in some cases, but a permanent paralysis with or without pneumothorax is ordinarily desirable. The slight loss of function following this procedure is rarely noticed by the patient. The attempt to save unnecessary function proves disastrous in all forms of tuberculosis. The danger of diaphragmatic hernia has been overestimated. The paralyzed diaphragm, while losing its muscle-tone, becomes a tense, firm membrane, stronger, if anything, than before.—*Collapse Therapy in Early Minimal Lesions of Pulmonary Tuberculosis, E. J. O'Brien, Am. J. Roentgenol. & Rad. Ther., 1933, xxx, 315.*—(*E. R. L.*)

Histological Changes in Lung Following Collapse Therapy.—These studies were carried out in normal animals, following phrenicectomy, pneumothorax and thoracoplasty. Histiocytic elements with large colloidal granules were more numerous in lungs treated by ordinary vital staining methods than in those vitally stained by rapid fixation. Pneumothorax and thoracoplasty induced not only an intense proliferation of mesenchymal elements but also an increase in the phagocytic powers of the histiocytes. Under prolonged pneumothorax therapy, proliferation of the histiocytes was

replaced by fibrosis. In collapsed lungs there was always marked hyperaemia of venous vessels and capillaries. In the contralateral lung the histological changes were limited to a slight hyperaemia and circumscribed alveolar dilatation. Following phrenicotomy mesenchymal proliferation occurred with a few histiocytes and marked hyperaemia. In the opposite lung there was slight hyperaemia. Pneumothorax refills in dogs were followed by an eosinophilia with neutrophilia and relative lymphopoenia.—*La istologia del polmone in condizione fisiologiche, nel pnt, nella frenicotomia, e nella toracoplastica, Bettini & Celotti, Tubercolosi, April & May, 1933, xxv, 109 and 145.*—(*U. E. Z.*)

Importance of X-Ray Examination in Treatment.—The roentgen examination provides the information for a quantitative and qualitative diagnosis in pulmonary tuberculosis. The cavity in tuberculosis signifies a most serious prognosis. Collapse therapy will serve to close many cavities and thereby convert a grave prognosis into a favorable one. The proper application of collapse therapy depends upon accurate visualization by means of the roentgen examination.—*The Importance of the Roentgen Examination in the Modern Treatment of Pulmonary Tuberculosis, B. H. Douglas, Am. J. Roentgenol. & Rad. Ther., September, 1933, xxx, 305.*—(*E. R. L.*)

Surgical Closure of Pulmonary Cavities.—An extensive cavity was successfully closed in one patient by an apicolysis; and in another patient by the severance of broad adhesions which were present in a pneumothorax.—*Two Remarkable Cases of Large Pulmonary Cavities Closed by Surgical Methods, B. Hudson, Tubercle, 1933, xiv, 548.*—(*T. O. R.*)

Closure of Cavities.—The closure of tuberculous cavities is desirable, but active measures should not be utilized if the risk incurred is greater than the hazard of the disease. Patients over fifty years of age probably should not be treated by active measures. The risks of a tuberculous cavity are (1) haemoptysis, (2) spread of infection within the chest or to other persons, and (3) perforation with subsequent pyopneumothorax. The active measures which may be utilized are discussed.—*The Closure of Cavities in Pulmonary Tuberculosis, B. Hudson and F. H. Hunnard, Brit. J. Tuberc., October, 1933, xxvii, 150.*—(*R. D.*)

Artificial Pneumothorax.—Pneumothorax was attempted in 139, or 28 per cent, of 487 admissions to the Peel Hall Pulmonary Hospital between 1929 and 1932, inclusive. A successful collapse lasting three months or longer was obtained in 59 of 99 sputum-positive cases and in 26 of 40 sputum-negative cases, or in a total of 17 per cent of the admissions. Twenty-five, or 42 per cent, of the 59 are working or fit for work, compared to 16, or 40 per cent of the 40 unsuccessful inductions. Of the latter group 19 had phrenicectomy and 11 are working or fit to work. Eighteen of the 26 cases with negative sputum, or 69 per cent, are working or fit to work, while only five, or 36 per cent, of the 14 sputum-negative cases in which pneumothorax was unsuccessfully attempted are working or fit to work. Unsuccessful induction is nearly always due to fibrosis, and, as the formation of the fibrous tissue is evidence of a healing process or tendency, it is reasonable to expect that in such cases the fibrosis, unsuspected perhaps at the time, will lead to healing of the lesion. We are thus comparing our successfully induced cases with cases in which, from the nature of the condition, a satisfactory result is not unlikely. The results of collapse therapy are appreciably better in a given time than the results of treatment used to be without it, although the close supervision that is needed in connection with artificial pneumothorax must be given due weight in assessing the value of this special ancillary method of treatment.—*Artificial Pneumothorax Treatment; Some Results and Conclusions, G. Jessel, Lancet, December 16, 1933, ccxxv, 1360.*—(*R. D.*)

Artificial Pneumothorax.—Four years artificial pulmonary collapse was considered contraindicated in the presence of recognizable tuberculosis in the contralateral lung. More recently experience has shown that in bilateral pulmonary tuberculosis unilateral collapse commonly has a favorable effect on each lung. The most reasonable explanation of the favorable effect in the contralateral lung is the decrease in size of its share of the thorax from shifting of the mediastinum. If there is not much difference in the involvement on the two sides, bilateral collapse may be carried out at the beginning of treatment, or the more involved side may be treated first and the opposite lung a month or two later. Phrenicectomy in addition may aid in the closure of cavities. In many cases of far-advanced tuberculosis at first looked upon as hopeless, much improvement has followed energetic and persistent employment of collapse measures, and the author recommends that patients of this type be offered this chance.—*Artificial Pneumothorax in a Group of Cases of Pulmonary Tuberculosis*

Formerly Looked upon as Hopeless, R. Morgan, Am. J. Roentgenol. & Rad. Ther., 1933, xxx, 309.—(E. R. L.)

Late Results of Artificial Pneumothorax.—The outcome after ten years is reported in a group of 250 cases originally reported in 1924, in which pneumothorax was induced or attempted prior to April, 1923. In this series treatment was started only if the patient showed no improvement after some six months' simple medical treatment. All deaths are recorded, although several were due to nontuberculous causes. Thirty-six out of 71 unilateral cases are alive and free from symptoms of tuberculosis after a period of more than ten years. On the other hand 46 out of 57 cases with active disease in the better lung are dead. These figures support the modern view that pneumothorax should be administered early and especially before there is involvement of the opposite lung. In 31 cases a partial collapse was obtained: 26 of these are dead. In 29 cases no collapse was obtained; 24 of these are dead. Ninety-nine patients in whom a successful pneumothorax was induced have died and 68 of these deaths occurred within four years. A successful pneumothorax was induced in 24 nontuberculous cases: 8 cases of pulmonary abscess, 8 of bronchiectasis, 3 of recurrent haemoptysis, 2 of chronic pleural effusion and 3 of carcinoma. Seven of the patients with pulmonary abscess are now well, while only two of the bronchiectasis cases are well.—*Late Results of Treatment by Artificial Pneumothorax, L. S. T. Burrell, Lancet, December 23, 1933, ccxxv, 1414.—(R. D.)*

New Pneumothorax Needle.—The numerous types of pneumothorax needles devised proves that none answers its purposes completely. A modified Kovats needle penetrates the skin and the intercostal space with a sharp point and the parietal pleura with a dull point and thus minimizes possible trauma to the visceral pleura. This needle consists of three parts,—a sharp-pointed needle into which is inserted a dull-pointed needle with a small apperture near the open end. It has a mandarin. When the operator reaches the external pleura one advances the internal (dull) needle and the pleura is perforated with the latter. The apparatus operates satisfactorily.—*Eine neue Pneumothoraxnadel, F. Hochstetter, Deutsche med. Wchnschr., September 22, 1933, lix, 1470.—(H. S. W.)*

Cardiac Output in Artificial Pneumothorax.—In two patients with unilateral pulmonary tuberculosis determinations were made of the oxygen consumption, oxygen utilization, minute volume and stroke volume of the heart before and during pneumothorax treatment. All these functions remained practically constant. As soon as the collapse is complete the oxygen consumption following exercise increases, but not beyond normal values. After one of the patients developed a pleural effusion the oxygen consumption following exercise increased beyond normal values. Previous to this study, determinations of cardiac out-put in pneumothorax were made only on three patients by Richards, Reiley and Hiscock (*Arch. Int. Med., 1932, xlix, 994*).—*Untersuchungen über das Minulenvolumen des Herzens in 2 Fällen mit einseitigem künstlichem Pneumothorax, G. Nylin, Beitr. z. Klin. d. Tuberk., September, 1933, lxxxiii, 470.—(M. P.)*

Spontaneous Fibrothorax.—Artificial or provocative fibrothorax is relatively common and frequently follows an exudative pleuritis, especially after artificial pneumothorax. Total spontaneous fibrothorax occurs independently of any pleuritic involvement and is very rare. The lung is retracted, hard, and unaerated. The pleura is tightly adherent to the lung from which it cannot be separated. The cicatricial retraction often gives rise to numerous cylindrical bronchiectases. Upon physical examination the involved hemithorax is retracted, sunken, immobile and the intercostal spaces are narrowed. Vocal fremitus and breath-sounds are absent or markedly diminished. The heart and mediastinum are displaced toward the affected side. When pressure interference on the superior vena cava occurs, superficial venous varices appear. Radiologically the fibrothorax side is opaque, the intercostal spaces are narrowed. The costal margins flare, the trachea, heart and aorta are displaced. Sometimes a transparency is seen along the paravertebral border of the affected side due to retraction of the normal contralateral lung. This condition is most commonly seen in patients suffering from pulmonary tuberculosis and represents the end-stage in fibrosis. It is also probable that it occurs most often in individuals showing a tendency to develop connective tissue rapidly and in excessive amounts. Left-sided fibrothorax is better tolerated than the right-sided because the concomitant circulatory disturbances are less severe. Mechanical disturbances of laryngeal function are encountered most frequently when the fibrothorax is on the right side. The prognosis depends upon the integrity of the myocardium.—*Il fibrotorace totale spontaneo, F. Giuffrida, Tubercolosi, March, 1933, xxv, 73.—(U. E. Z.)*

Respiratory Economy in Artificial Pneumothorax.—Under the influence of artificial-pneumothorax, changes take place in the mechanism of respiration which were studied by determining the tidal air and frequency of respiration and the minute volume. A group of 10 patients who had a unilateral, active cavernous pulmonary tuberculosis and in whom an uncomplicated artificial pneumothorax could be obtained was examined both before the initial inflation and during the course of the treatment. As an immediate effect of the first inflation was found an increase in the minute volume; the frequency was likewise uniformly increased while the tidal air was slightly increased only if the amount of air inflated was 600 c.c. or less. It seems therefore that air in the pleural cavity acts as a stimulation and disturbs the equilibrium of respiration. Entirely different is in many respects the effect of subsequent refills. The frequency is hardly affected after the third inflation while the tidal air appears to be definitely increased from the sixth or seventh week after treatment has been started. The minute volume too is higher only in the beginning but decreases as soon as an optimal collapse is obtained. The changes in the mechanism of respiration are interpreted as evidence of adaptation to the non-physiological artificial pneumothorax and are not satisfactorily explained by mechanical factors. The relaxation of the diaphragm alone which according to Hess is responsible for the diminished frequency and increased amplitude fails to explain the fact that all respiratory changes are most pronounced at the time when optimal collapse is obtained. It is therefore assumed that with the decreased absorption of toxins the centre of respiration is stimulated to a lesser degree. Artificial pneumothorax must be considered a measure which has not only local effects but influences and regulates the centre of respiration in the sense of the most economic aeration.—*Die Gestaltung der Atemöconomie unter Pneumothoraxbehandlung., A. Pätzold, Ztschr. f. Tuberk., December, 1933, lv, 172.*—(*M. P.*)

Misuses of Pneumothorax.—To a certain extent, artificial pneumothorax is being misused. A vast increase in clinical work has taken place in all tuberculosis institutions during recent years, without a corresponding increase in staff, so that the work is unavoidably hurried and lowered in quality. In the clinical selection of cases, the patient's response to the infection is not always considered. Within limits, depending upon the virulence and the intensity of the infection, the body is able to control the toxaemia and to produce a natural arrest of the lesion. In such cases, interference is unnecessary and may be harmful. The patient's resistance is determined only by a careful analysis and evaluation of the history and physical, roentgenological, and haematological examinations.—*The Misapplication of Artificial Pneumothorax in the Treatment of Pulmonary Tuberculosis, F. Heaf, Tubercle, October, 1933, xv, 13.*—(*T. O. R.*)

Phrenic Paralysis.—The contradictory reports about the value of hemidiaphragmatic paralysis can be partly explained by the fact that in various clinics different types of cases of pulmonary tuberculosis are seen, and the enthusiasm, or lack of it, for this procedure often depends on the stage of the disease at which the operation is performed. In many city clinics, when the diagnosis is made early and operation is often done without delay, the reported results are excellent. In many health resorts, however, where most of the cases are of the far-advanced type results have been much less satisfactory. The present study included 654 cases of all types of pulmonary tuberculosis, representing a fair cross-section of patients under care for active tuberculosis. The study was made in great detail, requiring eight months of full-time work by one of the authors. The excellent results here reported are not intended to indicate that phrenic-nerve operations should supersede all other forms of treatment, particularly bed-rest, since it is recognized that many of the cases would have probably improved on bed-rest alone; the results obtained are, however, far superior to those that could be expected from treatment of similar cases by bed-rest alone. In two of the 654 cases, the operation was unsuccessful, in that no paralysis of the diaphragm was obtained. In 612 cases, a follow-up study was possible. The patients ranged from 2 to 63 years in age, the sexes were about equally divided, the cases were approximately equally divided with regard to side of operation, and the results obtained on the right and left sides were essentially similar. In 302 patients phrenic-nerve operation alone was done; 186 had the operation following an inadequate pneumothorax; in 66 cases an inadequate result was obtained and was followed by pneumothorax or other procedures. In addition to the latter group were 67 cases in which the procedure was performed only as a preliminary measure to further surgery, such as thoracoplasty. In 58 per cent of the total cases the expected result, whether it was complete healing or mere symptomatic relief of some distressing symptom, was obtained, but in 30 per cent this expectation was not fulfilled. With regard to technique, the exairesis operation of

Felix is being replaced by the excision method of Goetze. In the present series no accidents or failures to obtain paralysis occurred as a result of exairesis, but the number of complications and failures reported by other writers led to preference for the Goetze operation in spite of the fact that in eleven of the 257 cases so treated paralysis was not obtained, apparently because of unperfected technique. Neither type of operation assured complete paralysis of the hemidiaphragm because of the possibility of not destroying all the accessory nerves. In 33 per cent of the cases reported, temporary phrenic interruption was produced; in bilateral lesions permanent paralysis is rarely instituted until a temporary paralysis has demonstrated its innocuousness for the opposite side. One-fifth of the temporary paralyses were later made permanent. Phrenic-nerve operations were often done in conjunction with other procedures, mainly pneumothorax, in bilateral tuberculosis, but bilateral phrenic interruption was never done and is strongly opposed. With regard to operative complications, local haemorrhage of more than trivial importance occurred only once, and this was controlled. Horner's syndrome is an occasional, temporary complication, but in three cases was permanent, due undoubtedly to severance of the sympathetic trunk through error. In 52 cases postoperative dyspnoea developed, but in only one case was this severe; this is the only case of the 654 in whom permanent damage was felt to have been produced by the operation. In one instance an acute process developed on the opposite side following phrenic exairesis. With regard to gastro-intestinal symptoms, nausea and vomiting of significant amount occurred in only 4 instances, and one of these followed right-sided operation. An analysis was made of the effect of phrenic paralysis with regard to extent of the disease, presence or absence of cavitation, *et cet.* Of 215 cases in which the operation alone was used in conjunction with bed-rest, closure of cavities occurred in 38 per cent; and closure occurred in 59 per cent of the 116 cases in which other procedures, such as pneumothorax were also used. Thus in 46 per cent of cavity cases, the cavities became closed following phrenic paralysis. In 30 instances, of the 113 patients without cavity, phrenic paralysis was produced as a prophylactic measure in quiescent or arrested cases. Phrenic paralysis is preferred to artificial pneumothorax for control of haemorrhage. On the other hand, in 14 cases haemoptysis occurred for the first time subsequent to the operation, although no causal relationship can be here supposed. No death resulted from the procedure; and in the 34 instances of death, of the total of 272 cases in which this was the only therapeutic procedure, gradual progression of the lesion had occurred in spite of operation. Of the 116 cases in which phrenic paralysis was instituted because of failure of pneumothorax, complete closure of the cavity occurred in 69. The failure to produce satisfactory improvement in 66 cases of phrenic paralysis led to the use of other collapse measures. Paralyzing the diaphram does not seem to cause adhesion-formation which might subsequently interfere with induction of pneumothorax. The best results of phrenic paralysis were obtained in limited, fresh lesions; the worst results in cases with extensive, fibrotic lesions containing large stiff-walled cavities. Since 34 per cent of the cases attained arrest, and 35 per cent improvement, phrenic paralysis is considered to be of genuine value in the treatment of tuberculosis.—*An Estimate of the Value of Phrenic Nerve Interruption for Phthisis Based on 654 Cases, L. W. Nehil and J. Alexander, J. Thorac. Surg., August, 1933, ii, 549.*—(*B. B.*)

Phrenic Paralysis.—In various types of tuberculosis, with the exception of minimal cases and acute febrile caseous cases, phrenic paralysis was used 201 times, both as a solitary procedure and in conjunction with other types of collapse therapy. Of the cases in which phrenic evulsion was done 28.7 per cent of the patients are well and working, 37 per cent are improved, 13.3 are unimproved, and 21 per cent are dead. This study covers an experience of six years; in no case was death attributable to the operation, and in none of the cases in which the disease progressed following the operation was the phrenic paralysis thought to have been responsible for the progression. The results indicate that it is the degree of rise of the diaphragm, and not merely cessation of diaphragmatic motion, that is the important factor in inducing healing. In 56 cases of cavitation, in which evulsion alone was done, 13 attained closure of the cavities. It is believed that maximum benefit is to be obtained in cases with lower-lobe lesions. Phrenic evulsion is often of value in stopping haemorrhage. Phrenic crush was performed 22 times with the following results: 4 patients are working, 6 are improved, 9 unimproved, and 3 are dead. The paralysis will last for 6 months or more if 0.5 cm. of the nerve is crushed; if more than this length is crushed, a considerably longer time may elapse before return of diaphragmatic function. In 6 cases of the 22 cases, the paralysis existed more than 12 months; and it is believed that if more than 1 cm. is crushed, permanent paralysis may well result.

Bronchiectasis has been treated by phrenic evulsions in 19 cases, with healing in 6 cases at the end of one or two years, improvement in six, and lack of improvement in seven. In those cases associated with bronchial stenosis phrenic paralysis may be a harmful procedure, since the operation, theoretically at least, interferes with coughing power. With regard to technique of the operation, luminal and codeine are used preoperatively. The incision is the one advocated by Lilienthal, over the clavicle, opposite the scalenus anterior muscle. After the main trunk of the phrenic is found, a search is made for the accessory nerves, provided the crush operation is to be done; if an evulsion is to be performed, this is not necessary if at least 5 cm. of the main phrenic are removed. In two instances the evulsion failed; in one of these, it seemed that the vagus was removed; in the other a large accessory branch of the phrenic was missed, but this was later found and removed. A Horner's syndrome was produced in only one case of this series, and this cleared up in three months. In cadaver dissection, accessory phrenic nerves occur in 30 per cent, but in operative work they have been found in only 15 per cent of the cases. In the series of cases reported no untoward effects, such as embolism, wound infection, thoracic-duct injury, atelectasis, immediate spread of the infection, or autotuberculinization have occurred. In one patient, following a left-sided operation, severe palpitation and flatulence occurred, but this was relieved by induction of pneumothorax.—*The Results of Phrenic Nerve Operations in 222 Cases with a Discussion of the Technic of the Operations, H. R. Decker, J. Thorac. Surg., August, 1933, ii, 538.*—(*B. B.*)

Phrenic Exairesis.—Many authors are of the opinion that operations on the phrenic nerve in pulmonary tuberculosis should supplant artificial pneumothorax. They state that phrenicectomy and other procedures are to be preferred as superior to pneumothrax because of their innocuousness and the economic disadvantages brought about by gas therapy. However, the increasing popularity of phrenic-nerve surgery will aid the future of artificial pneumothorax by limiting the indications and eliminating many of the abuses so commonly encountered in the past. Treatment by pneumothorax greatly benefits the patient because it allows more constant and prolonged supervision by the attending physician. The social and economic reasons advanced for preferring one or the other method are not important. The disease must be treated by the best and most rapid methods and each case must be judged on its own merits.—*La frenicoexeresi nella terapia chirurgica della Tubercolosi polmonare, I. Petrin, Tubercolosi, January, 1933, xxv, 1.*—(*U. E. Z.*)

Phrenicoexairesis. — Phrenicoexairesis was performed on 330 patients with pulmonary tuberculosis, more than two years ago. Of the total, 244 could be traced. In more than one half of the cases the operation was performed more than four years ago. All patients had cavities before the operation. The operation was performed as a separate and independent procedure in 60, following pneumothorax failure in 152, on account of premature loss of pneumothorax space in 34, as an auxiliary operation with incomplete pneumothorax in 42, with a contralateral pneumothorax in 15, as a preliminary operation to be followed by thoracoplasty or paraffin filling in 24, and following the last two operations in 3. Of the 244 patients who could be traced more than two years following the operation, 151 were able to work and 54 had died. Patients with lesions in the upper portions of the lung showed the best results. This fact is explained not by a selective action of the operation on this part of the lung, but by the fact that lesions in the upper fields are more often strictly localized and have therefore a better prognosis with or without operation. The technique and the operative complications are discussed.—*Zum Fragenkomplex der Phrenicoexairese.—Erfahrungen an 330 Fällen, E. Schwarzmann & E. Waltuch, Beitr. z. Klin. d. Tuberk., December, 1933, lxxxiv, 160.*—(*M. P.*)

Late Results of Phrenicectomy.—Editorial comment is made on the reported after-history of 200 patients treated by phrenicectomy in Prof. E. Rist's hospital (Paris) between October, 1923, and June, 1931. Twenty could not be traced and the fate of the remainder was disappointing. There were 100 who, six to eight months after operation, seemed well on the way to recovery, but, among these, two and a half to ten years later, only 25 recoveries could be claimed, with 16 others maintaining an improvement. Of this group of 100, 79 had supplemented the operation by living under sanatorium conditions with medical supervision for six months to two and a half years, and this group contained all but 4 of the 42 patients who derived permanent benefit from the operation. Among the 80 patients who did not derive even transitory benefit from the operation, there was only one who ultimately recovered and this patient had undergone sanatorium treatment. The lesson of these observations is obvious. Unless the early benefits of

phrenicectomy can be supplemented by the systematic rest and continuous medical supervision of the sanatorium, they are not likely to be maintained. Artificial pneumothorax gives better ultimate results because it entails periodical injections which in their turn imply medical control. The chief advantage claimed for phrenicectomy over an artificial pneumothorax is the freedom the former confers on the patient who has no irksome secondary operation, such as refills, to anticipate. But probably it is just this unpleasant discipline and all it implies which often saves the patient's life.—*Late Results of Phrenicectomy, Annotation, Lancet, December 23, 1933, ccxxv, 1438.*—(*R. D.*)

Fatal Case of Phrenic Avulsion.—A man, 23 years of age, suffered from bronchiectasis following a postoperative bronchopneumonia two years previously. The base of the right lung was extensively involved while the base of the left lung was only slightly so. He was treated by inhalations of creosote, postural drainage, and bronchoscopic lavage but he grew progressively worse. Phrenic avulsion was undertaken but, as the right phrenic nerve was clamped, the patient immediately became dyspnoeic and died shortly after. At the necropsy, complete collapse of the lower half of the right lung was found. The trachea and main bronchi contained much pus. Death was thought to have been due to asphyxia consequent to the sudden flooding of the whole bronchial tree by the pus squeezed out of the bronchiectatic cavities in the right base when the right dome of the diaphragm made its rapid ascent.—*A Fatal Case of Phrenic Avulsion, M. Cassidy & R. O. Lee, Brit. M. J., October 14, 1933, no. 3797, 684.*—(*T. O. R.*)

Influence of Phrenicotomy on Gastric Motility.—Under normal conditions the pillars of the diaphragm open and close the cardia with each phase of the diaphragmatic excursion. The peripheral portion of the diaphragm not only presses the fundus down but also aids in the lateral contraction of the fundus, thereby reducing its diameter. Coincident with these changes the *pars pylorica* is modified in shape and diameter. Therefore, the diaphragm plays an important rôle in the initiation and maintenance of gastric peristalsis. In patients with paralysis of the diaphragm compensatory changes in gastric motility occur so that normal contraction waves may still be initiated. The 40 patients of this study were divided into three groups. Those patients who had a distinctly costal type of respiration showed little or no rise in the diaphragm after phrenicotomy and, therefore, the operation could be of no significant benefit to this type of patient with pulmonary tuberculosis. Paralysis of the diaphragm produced no change in the motility of the gastrointestinal tract. In patients in whom the right leaf of the diaphragm was paralyzed the tone in the cardia was normal, the fundus descended with each diaphragmatic contraction, and the *pars pylorica* dilated coincidently. However, the angle at the cardia became more obtuse which increased the tendency to vomit during a coughing spell. In patients in whom the left leaf of the diaphragm was paralyzed, the imparted contractions were transferred to the *pars pylorica* moved laterally and slightly anteriorly and at expiration it moved medially and toward the spine. The degree of altered motility in the stomach depended upon the tone of the right leaf of the diaphragm.—*Gastric Motility as Influenced by Paralysis of the Diaphragm, A. J. Hruby and M. Joannides, Radiology, 1933, xxi, 49.*—(*T. O. R.*)

Results of Thoracoplasty.—This is a study of 44 patients whose histories are detailed and who underwent thoracoplasty. They have been kept under continuous observation for 2 to 10 years after the operation. The postoperative mortality was 9 per cent: 30 per cent died within the first year of the operation; 47 per cent are still in an active stage of the disease and incapable of doing any work whatever; 34 out of the 44 cases, or 80 per cent, have not benefited by the thoracoplasty; and 5 patients are capable of some work though they are still suffering from symptoms of tuberculosis. Thoracoplasty had no effect on controlling recurrent haemorrhage. Serial roentgenograms of each operative case have shown that complete collapse of tuberculous cavities did not result in a single case. The observation was confirmed at necropsy. Equally unfavorable results have been obtained in cases of pyopneumothorax. The authors are of the opinion that if these patients had not undergone thoracoplasty the results would have been much better. They conclude that the presence of even the most extensive anatomical changes in the lung does not call for treatment in the absence of toxic symptoms.—*Ultimate Results of Thoracoplastic Operations in Pulmonary Tuberculosis, J. J. Wiener and M. Fishberg, Arch. Int. Med., 1933, lii, 341.*—(*M. B. L.*)

Apicolysis.—Apicolysis is indicated in essentially unilateral apical lesions, with cavities that show a tendency to retract and in cases in which pneumothorax is not effective, as far as the open apical tuberculosis is

concerned. Good results may be expected only when the cavity is not too large. The technique that is recommended provides the approach by an anterior resection of the second rib. The entire apex must then be freed extrapleurally. Seventeen patients were submitted to this treatment; in 7 closure of cavity and disappearance of bacilli occurred; 5 patients were markedly improved and in 5 patients no benefit was produced. Some of the failures were due to the fact that the cavities were too large. Postoperative dissemination did not occur in any of these patients. When the desired result is not obtained, an upper-stage thoracoplasty or a paraffin filling may be done. It is advisable to always produce diaphragmatic paralysis preceding apicolysis.—*"Apikolysis Simplex" als Behandlungsmethode der isolierten Spitzenkavernen, A. O. Zorini, Beitr. z. Klin. d. Tuberk., December, 1933, lxxxiv, 224.—(M. P.)*

Pneumonolysis for Pulmonary Tuberculosis.—In an analysis of 700 cases of artificial pneumothorax the authors have shown that, with complete compression, 53 per cent of the patients are well and 24 per cent are dead; with partial compression, 25 per cent are well and 44 per cent are dead; and with no free space, 16 per cent are well and 60 per cent are dead. This is glaring proof that compression is successful only as it is complete. The authors have been doing intrapleural pneumolysis by the Jacobaeus-Unverricht method for four years and have converted 75 per cent of partial-pneumothorax-collapse into complete-collapse cases. It is a most valuable adjunct to pneumothorax treatment, and patients whose cavities are not closed after a few months' time should be given the opportunity of this type of operation. Unfortunately, many patients cannot be given pneumothorax because of a completely adherent pleura. These present another problem. At present there are two operations that offer less risk to the patient than thoracoplasty and also a fair percentage of good results. Extrapleural pneumonolysis and the introduction of a paraffin pack is effective in upper-stage cavities and, owing to the fact that it is one of the less radical of the major operations, can be used in patients who are not sufficiently good surgical risks for more radical surgery. It has its disadvantages. At times the paraffin breaks through the tissue; the wound becomes infected, which necessitates removal of the paraffin. However, this seldom happens and the results have been uniformly good. The fat pack, with or without a pedicle, has not proved nearly as successful. The results over a three-year period show 45 per cent of the patients clinically well and 27 per cent dead. An upper-stage thoracoplasty with mild silver-protein pack was devised by Dr. Joseph Casper. It is to be chosen rather than the paraffin pack unless the patient is a poor surgical risk. Here the chance of infection is reduced to a minimum. The patient has the added advantage of a selective collapse, since the lower part of the lung still functions. Unless the remaining lung is free from active disease, a complete thoracoplasty must be advised. The paraffin mixture for extrapleural pneumonolysis that has been most uniformly successful consists of 75 cc. of paraffin with a melting point of 55°C. and 25 cc. of paraffin with a melting point of from 43° to 44°C.; 1 cc. of bismuth carbonate and 0.05 cc. of vioform are added and the mixture is melted and sterilized. Before it is used it is again melted and shaken and allowed to cool until it kneads readily. In the Casper operation the authors use minor technical changes. A regular upper-stage posterior thoracoplasty is done, rather long sections of from four to six ribs being resected. The parietal pleura and intercostal bundles, together with the periosteum, are then dissected off well down to the spinal gutter and laterally for 2 or 3 inches. The anterior attachments of the apex are not disturbed. The whole upper portion of the lung is compressed against the anterior chest wall, and packed down with gauze bandage soaked in 25 per cent mild silver-protein. The muscles and skin are then closed over this. The first pack is removed in from seven to ten days. Repacking is then done every seven days until the compressed lung is set.—*Intrapleural and Extrapleural Pneumolysis in Treatment of Pulmonary Tuberculosis, L. S. Peters and P. G. Cornish, J. Am. M. Ass., September 9, 1933, ci, 826.—(G. L. L.)*

Pneumonectomy.—The left lung was removed because of the presence of a benign and a malignant tumor, respectively, in a child of three and a half and a woman of twenty-four. Two weeks before operation the lung was collapsed by pneumothorax, thus establishing a new circulatory and respiratory equilibrium. At the same time exposure of the lung, and operative manipulation were made easier. The incision was placed in the third interspace extending from the costal cartilages to the anterior axillary line, this anterior position giving the best exposure of the hilum. The ribs were spread apart. The vessels were transfixed and ligated with oiled, braided silk. The cartilaginous rings were cut in the first case and the bronchus sutured with medium silk sutures. An oblique incision of the bronchi

facilitated closure in the second. The ribs were approximated by silver wire and the wound closed in layers. The wounds were not drained, and aspirations revealed only a small amount of serosanguineous fluid. In the first case the heart was displaced to the left and the right lung expanded into the left chest within three months. The same readjustment was almost completed in the second case.—*Pneumonectomy: a Preliminary Report of the Operative Technique in Two Successful Cases, W. F. Rienhoff, Bull. Johns Hopkins Hosp., December, 1933, liii, 390.*—(*R. D.*)

Antibodies and Specific Treatment of Tuberculosis.—Cows and horses were vaccinated by subcutaneous and intravenous injections of human and bovine tubercle bacilli killed with formalin and suspended in "exotuberculin," which is the unheated Berkefeld filtrate of glycerine-broth upon which tubercle bacilli had grown for 4 to 6 weeks. The treatment was given every 6 to 11 days for a period of 6 to 8 months. The serum of these animals, added to tuberculin and kept in the incubator for 2 hours and in the icebox for 22 hours, neutralizes the thermic and general reactions called forth by the injection of tuberculin alone. The serum is rich in agglutinins, being active in 1:10,000 dilution. Precipitins against the tuberculin used in vaccination, as well as for other tuberculins, are also demonstrated in the sera. The precipitinogen is specific for tuberculin; mallein gives no reaction. These antibodies are also found in the milk of the cows. The precipitins can be demonstrated in the milk by the previous precipitation of the casein. Attributing the failure of serotherapy in tuberculosis, up to the present, to the development of serum sickness and anaphylactic phenomena on the repeated parenteral exhibition of the sera, the author urges the oral use of the sera and milk of such hyperimmunized animals.—*Tuberkulöse Antikörper und spezifische Therapie der Tuberkulose, G. Finzi, Ztschr. f. Immunitätsforsch., 1933, lxxxi, 7[illegible].*—(*M. B. L.*)

New Vaccine for Tuberculosis.—The Lübeck catastrophe probably has put an end to the solution of the problem of artificial, practically usable, specific immunization against tuberculosis with living tubercle bacilli. *AO* vaccine is a protoplasmic, sterile tubercle-bacillus culture prepared in the following way: A saponin-lipase culture of the human tubercle bacillus which had been freed from all foodstuffs was held in physiological salt solution at freezing temperature until it was unable to germinate. For this vaccine the following claims were made. It is a sterile, safe preparation: it consists of artificially killed, not degenerated bacilli, is easily absorbed, poor in wax, derived from specially selected, strongly immunizing strains of human tubercle bacilli. It is not a living vaccine, but is as good as living in an immuno-biological sense. It cannot be compared with tuberculin nor with the living, monovalent bovine strain of *BCG* nor with Friedmann's vaccine. It may be used as a diagnostic, prophylactic and therapeutic agent. It was employed in Japan in 96 infants from tuberculous families of which, after an observation time of 2½ years, 95 were entirely well and 1 died of measles-pneumonia. In Germany, 112 newborns from tuberculous families were vaccinated and, after observation of from 2½ to 4 years, all remained well but 3,—one died of tuberculous meningitis and 2 from other diseases. Several thousand children have been vaccinated during the past 5 years and so far no damaging effects have been known. As to the length of the immunization, a longer period of observation is still necessary. The polyvalency of the vaccine is shown in improvement in treated cases that had bronchial asthma, enuresis, acne, ophthalmia, etc. About 300,000 human beings have been tested diagnostically and treated therapeutically, with claims that are remarkable for the high incidence of cure.—*Wesen und Bedeutung der Tuberkulosevakzins AO., R. Arima, Deutsche med. Wchnschr., July 28, 1933, lix, 1166.*—(*H. S. W.*)

Gold Therapy in Tuberculosis.—Fifty cases of pulmonary tuberculosis were treated with the various gold preparations, sanocrysin, crisalbine, or solganol. Ten cases received sanocrysin and 38 crisalbine, and the total dosage was 5.3 gm. Two cases received solganol in total doses of 1.85 and 1.9 gm., respectively. If the general condition of the patient was sufficiently good, he was allowed to continue ordinary sanatorium exercise or work during the treatment and was confined to bed only for the remainder of the day after each injection. Complications occurred in 70 per cent of the cases as follows: fever, 20 per cent; rash, 20 per cent; stomatitis, 12 per cent; malaise and metallic taste, 12 per cent; "rheumatism," 12 per cent; gastrointestinal symptoms, 6 per cent; albuminuria, 4 per cent; nerve-lesions, 4 per cent; purpura, 2 per cent, and jaundice, 2 per cent. In certain cases the rash was relieved by intravenous injections of sodium thiosulphate. Exfoliative dermatitis developed in one case. The two cases in which syncope occurred received solganol. The results may be listed as follows: sputum diminished or disappeared, 64 per cent; sputum showing

decrease in bacillary content or becoming negative, 46 per cent; general condition worse, 12 per cent, and better, 88 per cent; temperature increasing, 10 per cent, decreasing, 52 per cent, and normal throughout, 38 per cent; and weight less, 14 per cent, and increased, 86 per cent. The results in 50 similar cases not treated with gold are as follows: sputum diminished or disappeared, 38 per cent; sputum showing decrease in bacillary content or becoming negative, 26 per cent; general condition worse, 8 per cent, and better, 92 per cent; temperature increasing, 6 per cent, decreasing, 36 per cent, and normal throughout, 58 per cent; weight less 14 per cent and increased, 86 per cent. More favorable results were obtained in those uncomplicated cases in which larger doses could be given. Patients with extensive bilateral disease with excavation did not react as favorably as the intermediate group. Improvement was especially marked in those cases in which a recent subacute spread of the disease had occurred. The present series appears to confirm the view that gold treatment has a temporary beneficial effect in selected cases of pulmonary tuberculosis. It is especially useful in diminishing the amount and bacillary content of the sputum. There appears to be a simultaneous improvement in the general condition of the patient. Moreover the psychological effect of certain individuals of an additional form of treatment to ordinary sanatorium regimen is quite convincing, and is of direct benefit to the patient. The frequency of complications necessitates close supervision during treatment.—*The Treatment of Pulmonary Tuberculosis by Gold, W. V. Cruden, Lancet, September 23, 1933, ccxxv, 699.*—(*E. H. K.*)

Artificial Light Treatment in Tuberculosis Dispensaries.—During the years 1928–1932 there were 1,507 patients with nonpulmonary forms of tuberculosis who completed their treatment at the 13 Lancashire County tuberculosis dispensaries equipped for artificial heliotherapy. Of these 1,283 were quiescent and apparently well (lesion healed), 135 were improved, 70 were stationary, and 19 were worse. The conditions treated included, for the most part, tuberculosis of the skin, lymph nodes with and without abscess-formation and skin involvement, bones and joints and abdomen. The results were particularly satisfactory in adenitis, with abscess-formation and skin involvement, and in lupus. Of 572 cases of the former condition 529 were healed, and of 265 cases of the latter condition 212 were healed. The results were also satisfactory from an economic point of view because the cost of treatment was comparatively low and because the majority of patients were able to continue their normal occupation. The duration of treatment which was carried out 2 or 3 times a week varied in cases securing healing from 7.9 months for tuberculosis of the abdomen to 17.2 months for lupus. The sensitivity of the skin was tested in each case and no set scale of exposure was followed. A slight erythema was aimed at and pigmentation was allowed to develop. The equipment of each clinic consisted almost uniformly of two "Sunrae" carbon-arcs for general irradiation, a Jesionek mercury-vapor lamp for general or local treatment, and a Kromayer mercury-vapor lamp with self-contained water-cooling apparatus for local treatment.—*Artificial Light Treatment at Tuberculosis Dispensaries, G. L. Cox, Brit. J. Tuberc., January, 1934, xxviii, 13.*—(*E. H. K.*)

Effect of Testicular Extract on Tuberculous Lesions.—Duren-Reynals has shown that there exists in the testes of normal rabbits a substance that has the remarkable power of enhancing skin infections produced by vaccine virus and by staphylococci. Pijoan found that this substance, when added to cultures of twenty different bacteria, caused enhancement to a high degree of the resulting intracutaneous lesions. Experiments are reported which were designed to determine whether testicular extract has a similar effect on infections with tubercle bacilli. Extracts of normal rabbits' testicles were made in Locke's solution and filtered through a Berkefeld filter. Rabbits were injected intracutaneously with human, bovine and avian tubercle bacilli with and without testicular extract. The lesions resulting from these injections with testicular extract were, without exception, more severe and more extensive than those resulting from injections of tubercle bacilli without extract. Microscopically there was no essential difference between the two types of lesions. The results of these experiments suggest the possibility of employing the enhancing factor in testicular extracts in diagnostic inoculations.—*The Effect of Testicular Extract on Experimental Tuberculosis in Rabbits, I. Skin Lesions, T. T. Walker & D. C. Hoffman, Am. J. Path., September, 1933, lx, 651.*—(*J. S. W.*)

Asbestosis.—Since 1880 the world production of asbestos has increased so tremendously that from 35,000 to 40,000 workers are now engaged in its quarrying and manufacturing processes. Asbestos composes, or is incorporated, in a great variety of articles, such as matches, filter pads, paints, roofing tiles, high-pressure jointing, electrodes,

brake-linings, clutch-rings, and insulating materials. The term, asbestos, is applied collectively to a variety of silicate minerals which differ from each other in chemical composition and physical properties but resemble one another in their fine fibrous nature and flexibility. Asbestosis may be defined as a specific occupational disease of the lungs caused by the inhalation of asbestos dust and characterized by the progressive development of fibrous tissue. The history of asbestosis is reviewed. Asbestos causes a diffuse dispersion of fibrotic tissue throughout the lungs. The symptoms are insidious in their onset and irregular in their course. They consist of cough and shortness of breath on exertion. The patient's lips may be slightly blue in contrast with the general pallor of his face. The percussion note is slightly impaired throughout both lung fields. The roentgenograms show a diffuse ground-glass appearance together with a fine pinhead mottling. The roentgenographic appearance of advanced stages is not specific for asbestos dust. Fatal issue results commonly from a low grade bronchopneumonia, but may be due to lobar pneumonia, bronchitis, influenza, or, less often, a subacute tuberculous infection. With the exception of a mild degree of bronchitis which is more often mechanical in origin than infective, there is no evidence that the existence of developed asbestosis predisposes to acute infections, but if, however, an acute infection does supervene, the remaining undamaged lung tissue is unable to cope with it. In the lungs of asbestos workers are found asbestos bodies and spicules. These asbestos bodies are thought to originate from asbestos fibres which are modified by residence in the lungs. They have not been found in asbestos corns. Since they are found in the lungs shortly after exposure, their presence in the sputum merely indicates exposure to asbestos dust and gives no clue as to the time of exposure. If, however, they are found in clumps in the sputum, identical with the clumps seen in sections of the fibrosed lungs, their presence points to disintegration of lung tissue. Within certain limits, the length and intensity of exposure determine the rapidity of onset of the disease. The incidence rates in different processes in the industry are likewise modified by these two factors. From case histories, it becomes apparent that when the dust is highly concentrated the minimum period between the commencement of exposure and the production of a serious degree of asbestosis is approximately seven years, although an average interval is eleven years. From a review of 42 fatal cases of confirmed asbestosis, it appears that asbestosis shortens life, develops more rapidly than silicosis, is less frequently accompanied by tuberculosis than is silicosis. The immediate prognosis is far more dependent on extraneous considerations than on the precise degree of fibrosis present in the lungs. A comparason was made of the incidence rates of asbestosis amongst workers engaged in various processes in order to determine, if possible, the amount of dust which, from a practical standpoint, could be inhaled with impunity. The processes were divided into the six following groups: (1) crushing, opening, disintegrating and mixing; (2) carding; (3) spinning, twisting, doubling, plaiting, etc.; (4) insulating mattress-making; (5) weaving and associated processes; (6) miscellaneous. From a statistical analysis it became evident that the exposure to dust of "spinners," as a whole, was not greatly in excess of the maximum safe limit. Therefore, the conditions arising from flyer spinning, carried on without exhaust under good general conditions, were considered as the safe criterion for appropriate dust-suppression methods, and termed the "dust datum." In Great Britain, a code of regulations, the Asbestos Industry Regulations, designed to abolish this dust hazard became effective in its entirety on March 1, 1933. The aim of these preventive measures is to stop the development of asbestosis in new entrants into the industry. Localized exhaust ventilation, enclosure of dusty operations, and wet methods of manufacture are the agencies that have been emphasized to attain this goal. The Workmen's Compensation Act provides for the periodical medical examination of all workers exposed to any appreciable risk of developing asbestosis, for compensation for death and for partial or total disablement due to asbestosis or asbestosis accompanied by tuberculosis, for the suspension of workers suffering from asbestosis, asbestosis accompanied by tuberculosis, or tuberculosis to such a degree as to make it dangerous for them to continue work in the processes, and for the exclusion of new entrants who are unsuitable on medical grounds for employment in the industry.—*A Memorandum on Asbetsosis, E. R. A. Merewether, Tubercle, November, December, 1933, and January, 1934, xv, 69, 109 & 152.*—(*T. O. R.*)

Pulmonary Asbestosis.—Comparative freedom from symptoms for a long time followed by a slow development of characteristic fibrosis is a distinguishing feature of pulmonary asbestosis. Onset of symptoms and their severity depend upon the amount of dust inhaled and the nature of the work. Dyspnoea is one of the earliest symptoms. It is progressive and may be out of proportion to the physical signs. Harsh nonproductive

cough later accompanies dyspnoea. Expectoration may be absent. When present it usually consists of small amounts of thick, tenacious, glairy, mucoid material. Anorexia may occur early but is not always present. Cyanosis may be present, especially in the more advanced cases. Emaciation is a distinctive feature and may be out of proportion to the physical signs. Finger clubbing is present in the more advanced cases. Asbestos corns may be present over the body. All symptoms are aggravated in winter. The physical signs are those of a basal fibrosis spreading upward. The upper lobes may be emphysematous. Radioscopic examination affords the most reliable single piece of evidence in the establishment of a diagnosis and classification of the stage of the process. The first stage shows limited diaphragmatic motion, heavy shadows and basal linear striations. Some loss of translucency may be present at the bases. In the second stage the opacity at the bases is increased and a fine punctate stippling appears. The interlobar pleura may be thickened. In the third stage there is evidence of pleural involvement with or without mediastinal displacement. In the fourth or final stage the punctate mottling has spread upward but is still distinct from the coarse mottling seen in silicosis. Macroscopically the pathological features are thick visceral pleura, diaphragmatic adhesions, bronchiectasis with cavitation or honey-combed appearance, and firm, tough, grayish-black, airless lungs which may show areas of emphysema in the upper lobes. Microscopically the pulmonary interstitial tissue is everywhere increased, so that the alveolar structure may be partially or totally obliterated. Asbestosis bodies are seen in and around the densely fibrous areas. Desquamation of alveolar and bronchial epithelium may be seen. Stippled and pigmented asbestosis giant cells are present in the connective tissue. Asbestosis bodies are golden yellow in color, and vary in size and shape but have bulbous enlargements at the extremities resembling dumb-bells. They vary from 20 to 200 micra in length. An asbestos fibre forms the central core. This is covered with an iron substance, probably a silicate, which gives a reaction with prussian blue. The bodies are found in the sputum, the lung juice, faeces, and even the spleen and upper abdominal lymph nodes. They may be found singly or in clumps. The presence of clumps is comparable to the presence of elastic tissue in tuberculosis. Formerly it was considered that tuberculosis was an uncommon complication of asbestosis. But most of the studies were made upon workers at work. It is now known that studies made later in the disease show a much higher incidence of tuberculosis. There is a definite hazard of tuberculosis to asbestos workers. No person with any form of tuberculosis should be allowed to enter the asbestos industry nor should any person in whom it is detected be allowed to continue in the industry. The average length of time from the first exposure to asbestos dust to the fatal termination with pulmonary asbestosis is but one-half that found in cases of simple silicosis. Symptoms usually appear from 5 to 15 years after the first exposure to dust. Patients with asbestosis really suffer, in contrast to patients with silicosis who look and feel well. Haemoptysis is rare. Fatal termination is due usually to bronchopneumonia or tuberculosis.—*Pulmonary Asbestosis: Its Clinical, Radiological and Pathological Features, and Associated Risk of Tuberculous Infection, P. Ellman, J. Ind. Hygiene, July, 1933, xv, 165.*–(*J. F. B.*)

Morbid Anatomy and Histology of Asbestosis.—The peculiar long needle-like shape of the asbestos particles cause distinctive postmortem findings. The character and extent of involvement is influenced by the physical structure and chemical composition of the asbestos, the length and massiveness of the exposure, the race and age of the individual worker. In addition, the anatomical findings may be confused by other respiratory diseases. In the pleura the disease is characterized by an obliterative process. In the lung of an uncomplicated case, the disease is manifest by blue-black areas, corresponding to the secondary lobules, which are surrounded by thick bands of interlobular connective tissue, generally with a reddened background of terminal bronchopneumonia in the less affected portions of the lung. The gross changes in other organs are few. The asbestosis lung may show five different kinds of particles; namely, carbon pigment, common to all town-dwellers; amorphous brown pigment, presumably blood; minute, sharply-outlined, jagged, black particles, probably carbonaceous; the asbestos fibre; and the asbestosis body. Asbestos fibres are readily found in the upper respiratory tract of workers. The fibres are of a highly resistant nature. They are straight, highly refractive, and vary greatly in length. Under dark-field illumination, they may have edges rather suggestive of saw-marks on freshly cut planks. The tissue reactions to the invading fibre are thickening of the fibre to form the asbestosis body; cellular changes, of which the chief are the accumulation of large phagocytic dust cells and asbestosis giant cells, and the fibrosis common to all forms of pneumonoconiosis. The asbestosis giant cell probably

results from partial degeneration of small collections of phagocytes and is, therefore, not a single cell in the true sense of the word. The most characteristic histological feature of the asbestosis lung is the localization of the fibre at the distal end of the respiratory bronchiole and in the alveolar ducts with the immobilization and long persistence of large mononuclear phagocytes and especially of the asbestosis giant cells. As the disease progresses the lymphatics and adjacent air-sacs become blocked with phagocytes and asbestos dust. Finally there is an increase of connective tissue around the bronchioles, alveolar ducts, air-sacs, capillaries, venules, and in the interlobular septa and beneath the pleura. Ultimately these changes become so extensive as to completely obliterate all lung structure. The most important complications and sequelae of pulmonary asbestosis are purulent bronchitis, bronchopneumonia, pulmonary tuberculosis, and, more rarely, empyema and bronchiectasis.—*The Morbid Anatomy and Histology of Asbestosis, S. R. Gloyne, Tubercle, 1933, xiv, 445, 493, 550*—(*T. O. R.*)

Pneumonoconiosis.—The inhalation of dusts in sufficient quantity to cause pulmonary changes is essentially an industrial hazard. Silica dust has been found to produce the most extensive changes. Only particles of dust less than 10 micra in diameter reach the alveoli. The characteristic pathological change is a fibrosis of the lymphatic vessels and nodes. Roentgenological examination of the chest is the most reliable method of diagnosis.—*Pneumonoconiosis, F. Flinn, Radiology, August, 1933, xxi, 173.*—(*T. O. R.*)

Prognosis of Silicosis.—A group of about 300 patients with silicosis was observed for more than two years after the diagnosis had been made and after work in the mine had been abandoned. One-half of the patients were observed five to eleven years. There were 120 patients with silicosis of the first degree; 20 per cent of them showed marked aggravation during the period of observation, 13 reaching the second degree and 11 the third degree. Four patients of this group died. After more than seven years' observation, one-half of all patients showed sufficient progression to be classed in the second degree. Six per cent developed active pulmonary tuberculosis. There were 115 patients who stopped work after they had reached the second degree; of these, 40 per cent developed to the third degree, 13 per cent died, and 20 per cent developed pulmonary tuberculosis. All patients who developed active pulmonary tuberculosis were progressive. There were 74 patients with silicosis of the third degree, of whom 19 per cent died within the first three years and 87 per cent of whom were observed for eight to twelve years. After five years more than one-half of all these patients were dead. Of those who died, 72 per cent had an active pulmonary tuberculosis, while in 35 per cent of all cases tubercle bacilli were demonstrated. The prognosis of silicosis is much graver in younger people. Early appearance of the disease indicates probably particularly heavy exposure and possibly inadequate filtration in the upper respiratory tract. Silicosis in later age is not infrequently quite stationary. Active pulmonary tuberculosis is not noticeably modified in the presence of slight (first-degree) silicosis, but patients of second- or third-degree silicosis show a marked susceptibility to tuberculosis and in such individuals tuberculosis is always progressive.—*Die Prognose der Staublungenerkrankung (Silikose), A. Böhme, Beitr. z. Klin. d. Tuberk., December, 1933, lxxxiv, 119.*—(*M. P.*)

Mortality from Silica Dust.—This statistical study is based upon data from the last British Report on the Occupational Mortality of Males. The figures for several occupations exposed to silica dust were pooled and as a control a similar group of occupations exposed to dust which contained no silica. At the same time another group of the population, used as standard in the Registrar General's Report, was studied. Each occupation in the first group was balanced as nearly as possible with similar occupations in the second group. A standard population in comparative mortality figures is one in which there are 1,000 deaths in unit population. In the study of mortality from all causes the standard population shows 1,000 deaths, the silica dust-group 1,984 and the nonsilica dust-group 967 deaths. At the age 20 the death-figure in the silica group is lower than in the standard population but after the age 25 it increases rapidly. At 45 it is nearly double that of the standard. In the nonsilica group the mortality is lower than in the standard up to age 55 when it approaches normal or standard. In the study of mortality from separate causes some 23 diseases and causes of death are analyzed. These include influenza, tuberculosis, cancer, diabetes, heart disease, peptic ulcer, hernia, nephritis, appendicitis and many others. In only three of these, diabetes, appendicitis and diseases of the digestive system, is the mortality rate of the standard population comparable to that found in the silica dust-group.

In all others it is distinctly lower. This is more marked in such diseases as all forms of tuberculosis, rheumatism, bronchitis, pneumonias and hernia. Further study shows every part of the body to be affected. That is, diseases of the circulatory, the nervous and digestive systems, even the excretory organs, show a higher mortality rate in the silica dust-group as compared with the standard population. The silica must escape from the lungs by the blood-stream and exert its influence on almost every other part of the body. The conclusion is reached that silica may act as a body poison as does lead. Even though it exerts its worst influence upon the respiratory system, other organs are affected. The silica dust hazard is probably the most widespread and insidious of all hazards in the human environment.—*The Mortality Experience of an Occupational Group Exposed to Silica Dust, Compared with That of the General Population and an Occupational Group Exposed to Dust not Containing Silica, E. L. Collis and G. U. Yule, Journ. Indust. Hyg., November, 1933, xv, 395.*—(*J. F. B.*)

Tuberculo-Silicosis.—A man, 46 years of age at the time of his death on April 13, 1932, had worked steadily as a dry driller in quartz dust from 1914 to 1917. During the next seven years he was engaged in this occupation about one-third of the time. When first seen in 1924, there was evidence of a tuberculous infection in the right apex and bilaterally in the hilar lymph nodes. Serial roentgenograms were taken and, beginning in 1925, the gradual progressive development of an extensive nodular infiltration was observed. These nodules were found by pathological and mineralogical studies to be due to silicosis and tuberculosis. Because approximately the same percentage of silica was present in all parts of the lung, it was regarded as basically responsible for the terminal gross appearance. Inasmuch as silicosis in this man was not manifest, either clinically or roentgenologically, until after a period of about five years of mining or a total of ten years after the beginning of exposure, it raises the problem of the length of a just interval between exposure and the establishment of liability claims.—*Presentation of a Case of Tuberculo-Silicosis: Its Roentgen, Pathologic, and Mineralogic Findings, P. H. Pierson, Radiology, October, 1933, xxi, 395.*—(*T. O. R.*)

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